IN THE SUPERIOR COURT OF THE STATE OF ARIZONA

FOR THE COUNTY OF YAVAPAI

STATE OF ARIZONA,

Plaintiff,

vs.

JAMES ARTHUR RAY,

Defendant.

Case No. V1300CR201080049

REPORTER'S TRANSCRIPT OF PROCEEDINGS

BEFORE THE HONORABLE WARREN R. DARROW

TRIAL DAY FIFTY-TWO

JUNE 8, 2011

Camp Verde, Arizona

REPORTED BY
MINA G. HUNT
AZ CR NO. 50619
CA CSR NO. 8335

IN THE SUPERIOR COURT OF THE STATE OF ARIZONA

FOR THE COUNTY OF YAVAPAI

STATE OF ARIZONA,
Plaintiff,
vs
JAMES ARTHUR RAY,
Defendant.

Case No V1300CR201080049

REPORTER'S TRANSCRIPT OF PROCEEDINGS

BEFORE THE HONORABLE WARREN R. DARROW

TRIAL DAY FIFTY-TWO

JUNE 8, 2011

Camp Verde, Arizona

REPORTED BY
MINA G HUNT
AZ CR NO 50619
CA CSR NO. 8335

APPEARANCES OF COUNSEL:

For the Plaintiff:

YAVAPAI COUNTY ATTORNEY'S OFFICE
BY: SHEILA SULLIVAN POLK, ATTORNEY
BY: BILL R. HUGHES, ATTORNEY
255 East Gurley
Prescott, Arizona 86301-3868

For the Defendant:

THOMAS K. KELLY, PC
BY: THOMAS K. KELLY, ATTORNEY
425 East Gurley
Prescott, Arizona 86301-0001

MUNGER TOLLES & OLSON, LLP
BY: LUIS LI, ATTORNEY
BY: TRUC DO, ATTORNEY
355 South Grand Avenue
Thirty-fifth Floor
Los Angeles, California 90071-1560

MUNGER TOLLES & OLSON, LLP
BY: MIRIAM L. SEIFTER, ATTORNEY
560 Mission Street
San Francisco, California 94105-2907

INDEX

Proceedings had before the Honorable WARREN R. DARROW, Judge, taken on Wednesday, June 8, 2011, at Yavapai County Superior Court, Division Pro Tem B, 2840 North Commonwealth Drive, Camp Verde, Arizona, before Mina G. Hunt, Certified Reporter within and for the State of Arizona.

5

PROCEEDINGS

(Proceedings continued outside presence of jury.)

THE COURT: The record will show the presence of Mr. Ray and the attorneys.

And I want to discuss the juror note first. It had to do with scheduling. And through next week there would be seven days remaining. If the trial were to go beyond that, I would not be available the 22nd, 23rd, and 24th. If the case goes through July, that would be 11 days. The juror's question had to do with plans around July 4th.

Ms. Polk.

MS. POLK: Your Honor, what the state estimates -- our best estimate is perhaps three witnesses for rebuttal. And then if the jury finds the defendant guilty, the state has filed our allegation of aggravating circumstances, and we estimate two days to prove those.

MR. LI: I'm sorry. I didn't hear the last part.

We don't think there should be a problem with the juror taking the time to -- for that vacation. We anticipate -- I mean, some of this is

6

going to be a game-time decision. As the Court is aware, there is one issue that we need to deal with. But we think we should be able to wrap up relatively soon.

And if I could approach, I can perhaps have more discussion about this, Your Honor.

THE COURT: Okay. We can do that.

(Sidebar conference.)

THE COURT: Okay. I'd rather do it here and they just -- you know -- if we can.

MR. LI: I have no secret other than I just don't want it getting into the press.

THE COURT: I understand.

MR. LI: We're going to definitely have Mr. -- Dr. Paul. It's possible that we're going to have Mr. Ray. That's a game-time decision. It's quite possible that we're not going to have Mr. Ray testify. But I don't want to say that we're not going to have him testify, and then we decide we need to have him testify -- you know -- and misrepresent to the Court that we planned not to have him testify.

So I think it's quite possible that we can finish this week, in which case it would be good to try to settle up some jury instructions.

7

There is questions as to what the rebuttal case would actually be.

One other issue is we had listed Detective Diskin as a potential witness. The only reasons we would need to do so, and we can do this part on the record, is to introduce three tapes and the issue of the waivers through him. But the three tapes are the two wood tapes and the one rat poison tape. Again, we've already laid the foundation for all of them. These are the clips from the Mercers. If I'm making any sense at all, Judge.

THE COURT: I'm just trying to think which recordings.

MR. LI: There is two recordings from Ted Mercer. When he's asked what's different, he says, I think it's the wood. One on October 8, one on October 9. One at the hospital, two -- Williams -- Detective Williams and the other one to Detective Diskin. And we would introduce those for the same reason we're why we were able to introduce the organophosphates tape. We've laid the foundation for it. He's acknowledged that it's him. I would be happy to just move it in right now. I don't think any additional foundation needs

8

to be laid for those.

THE COURT: Let's not address that at sidebar. That's something we can do on the record.

MR. LI: That's just a scheduling issue. So, for instance, if we didn't need to do that, Detective Diskin, we wouldn't call him.

THE COURT: I'll tell you, I'm a bit concerned about trial length. We have one juror who's already been told he can be gone the second week of July, which I won't be here then either. That's absolutely out. So I'm pretty concerned about telling this fellow, because I think one guy would be gone.

And, Ms. Polk, you're indicating rebuttal already. We've heard from Dawn Sy -- you know -- so you're just anticipating there is going to be some kind of rebuttal, I guess.

MS. POLK: We don't know without knowing whether or not Mr. Ray is going to testify. It's hard for us to predict where we need to go. Dr. Paul either.

MR. KELLY: Simply in regards to scheduling, I see --

Correct me if I'm wrong, Luis.

One of two potential scenarios. One

would be that after Dr. Paul's testimony, then the admission of the exhibits described by Luis. The defense case would be complete.

I also see some significant discussions relating to the appropriate jury instructions, some other legal issues, renewal of the Rule 20, maybe some other matters that will be discussed in public on the record, of course, then closing arguments. That's one scheduling possibility.

I would submit that if that's the case, the rebuttal would be limited to rebutting the defense case, which would not include any participant witnesses. It would simply be evidence, if any, to rebut the testimony of Dawn Sy and Dr. Paul.

The other scenario is -- and as Luis said, we haven't made this final decision -- would be Dr. Paul followed by Mr. Ray. And, of course, that's his decision. That's something, my experience has been, that you need to discuss with him. That it's his decision to have an opportunity to testify, et cetera, out of the presence of the jury. And if he testifies, then given the length of direct and cross-examination and rebuttal witnesses, I do see a different scheduling problem.

THE COURT: And that one juror, he's going to be gone because he was told, I don't think you have anything to worry about. He's made long-time plans. I think for today I'm just going to ask this juror not to make plans. I think that's the safest thing to do.

MR. LI: Do we have a calendar just to see when the 4th of July falls? I just hate to mess up somebody's 4th of July. Because if -- I don't know what his or her plans are, but the 4th would be off. The 5th would be a motion day, and whatever we were going to do would start on the 6th.

MS. POLK: What Luis is saying, which is maybe his concern is just that Tuesday, for example, we wouldn't be in trial anyway.

MR. LI: I'm going up to Mule Day in Bishop, California too. So --

THE COURT: Planning those days, adding three more, that would be 14 more days, including the days I can't be there. I can present it that way if it is just over the 4th of July weekend. But I wanted to allow for -- I just have to tell him the schedule, the days I'm going to be out. That would be 14 days.

MS. POLK: And I don't know if you told us,

Judge. Are you here the day before the 4th of July weekend? That Friday before the 4th of July weekend?

THE COURT: Yes. The day -- that's what I'd be adding back would be those three days -- oh. Before the 4th of July. Yeah. It falls on the 1st, Friday, the 1st.

MS. POLK: You're here the 1st?

THE COURT: Yes.

MS. POLK: I'm thinking a lot of times for the 4th of July weekend people take the Friday and the Monday. We don't really know what exact dates he has plans for.

THE COURT: I can announce these dates, and he'll have to --

MR. KELLY: Can I see the calendar, Judge?

THE COURT: He left it open to say, can I do this? Then I'm gone that next week. Okay.

MR. KELLY: Did you say you're not available?

THE COURT: I'm out the 22nd, 23rd and 24th of June. And, again, the same week that the other juror would have the problem, we said we don't think it should be a problem is the week that includes July -- Monday, the 10th -- July 10, that week.

MR. LI: So you're gone for the whole week?

THE COURT: It's Monday the 11th, Sunday 10th, that whole week from the 10th to the 16th I'm out.

MR. KELLY: And remind me again. One juror had the family get together. What day was that in June?

THE COURT: It's the 16th. It's the --

MR. LI: 16th and 17th of June.

THE COURT: 16th and 17th of June. But he indicated if he can't do the whole thing up in Utah, he's not going to do it. So that's just how that's going to be.

Okay. Thank you.

(End of sidebar conference.)

THE COURT: And then just discussing general calendar issues up here, I'm going to tell the jurors when I'm not going to be available, in any event, June 22nd, 23rd, and 24.

And then at the same time, the same week that the other juror has the concern, and it's been indicated to him that I did not think it would be a problem, and that's the week that begins July 11. And I'll just tell this juror with the question that if it's a question of a long weekend from the -- anyway from the Saturday through Tuesday, it

probably would not be an issue. If it's longer, I'm going to ask that he not make those plans since he did phrase it in that fashion anyway.

All right. Anything else before we bring the jury back in?

Ms. Polk?

MS. POLK: No, Your Honor. Thank you.

THE COURT: Mr. -- Ms. Do?

MS. DO: No, Your Honor.

THE COURT: Okay. Thank you.

(Recess.)

(Proceedings continued in the presence of jury.)

THE COURT: The record will show the presence of the defendant, Mr. Ray, the attorneys, and the jury.

And, ladies and gentlemen, before we get started, I mentioned I wanted to discuss the one note I had. And it had to do with getting plane tickets around the 4th of July. I've already told one person who inquired about the week of -- the week of July 11. That's a Monday. In any event, I would not be here that week.

And it's still my assessment that the matter should be -- I'm just looking at planning,

submitted to the jury by -- you know -- and the case completed by July 1st. That's what I'm looking at. That's my view.

We've had unexpected delays in the case. That's not unusual when you have a long case such as this. So I've just got to look at possibilities and realizing none of us has a crystal ball. But with regard to this particular inquiry, if it's a question of the weekend -- through the July 4th weekend, including Tuesday, that's not going to be an issue. Tuesday would not be a trial day anyway because it's one of those days where my other calendar work has to be done on Tuesday because there is no Monday due to the holiday.

If it involves the whole week or something, I would ask that there not be plans at this time. But if there is need for further discussion, please feel free to do that. Give me a note. I can talk with the parties present with the juror, and we can discuss the scheduling issues.

I'll say this again, and I haven't said it recently. I've said it a number of times throughout the trial, and I mean it sincerely. Obviously everyone realizes how much time and effort you all have put in this case, and it's

greatly appreciated. Please don't think that I'm taking that lightly in any way. I'm certainly not, and nobody is. But I just want to make sure that the trial can be completed and we have our panel.

I also wanted to mention too that June 22nd, 23rd, and 24th I would not be available on those days either, so those are days when trial cannot take place. I'll mention that.

Now, please don't be thinking about this through the trial. If you have some concerns, make sure you make up a note and give it to Ms. Rybar, and this will be addressed as soon as we can. So I just wanted to mention that to start out.

Ms. Do.

MS. DO: Thank you. Good morning, Your Honor. The defense calls Dr. Ian Paul.

THE COURT: Sir, if you would please step to the front of the courtroom where the bailiff is directing you.

And then raise your right hand to be sworn by the clerk.

IAN PAUL,

having been first duly sworn upon his oath to tell the truth, the whole truth, and nothing but the truth, testified as follows:

THE COURT: Please be seated here to my right.

Would you please begin by stating and spelling your full name.

THE WITNESS: Dr. Ian Paul. I-a-n, last name P-a-u-l.

THE COURT: Thank you.

Ms. Do.

MS. DO: Thank you, Your Honor.

DIRECT EXAMINATION

BY MS. DO:

Q. Good morning, Dr. Paul.

A. Good morning.

Q. Would you please tell the jury what you do for a living.

A. I'm a staff forensic pathologist at the Office of the Medical Investigator in Albuquerque, New Mexico.

Q. And how long have you been a forensic pathologist for the State of New Mexico?

A. Seven years.

Q. Are you a medical doctor?

A. Yes.

Q. And when did you receive your medical license?

A. In 1996.

Q. So by my count, you've been a medical doctor for about 15 years?
A. Yes.
Q. Are you trained in any specific area of medicine or areas of medicine?
A. Yes.
Q. How many?
A. Three different.
Q. Would you tell the jury what those three areas of medicine are.
A. I have trained in emergency medicine, and I'm board certified in emergency medicine. I've trained in anatomic pathology, and I'm board certified in anatomic pathology. And I've also trained in forensic pathology, and I'm board certified in forensic pathology as well.
Q. Are you also trained in internal medicine?
A. I did one year of internship in internal medicine. But I'm not board certified in internal medicine. No.
Q. Okay. And we'll go back through those areas and explain what they involve.
You told the jury that you are employed by the Office of the Medical Investigator. And

that is with the University of New Mexico?
A. That is correct.
Q. And would you tell the jury what the primary function is of the Office of the Medical Investigator for the State of New Mexico?
A. By state statute, our primary purpose is to investigate sudden, unexpected, and violent deaths as they occur in the State of New Mexico. Briefly, we do that through scene investigation or investigating scenes of death, performing autopsies, and also doing other laboratory testing as needed. This is all to determine the cause and manner of death for each of those --
Q. So --
A. -- decedents.
Q. I'm sorry I cut you off. So have you worked in cases involving homicide?
A. Yes.
Q. Suicide?
A. Yes.
Q. Accidents?
A. Yes.
Q. Undetermined or unattended deaths?
A. Yes.
Q. Now, you said you worked for the Office

of the Medical Investigator. Is that a state agency, or is it part of the University of New Mexico?
A. It's both. And we're both state employees and University of New Mexico employees.
Q. Do you assist in the investigations of causes of death for a particular agency in the State of New Mexico?
A. No. We're an independent, freestanding agency in the State of New Mexico.
Q. Okay. Is one of the primary functions -- and I'm going to call it OMI for short, if you don't mind.
A. Yes.
Q. Is one of the primary functions of the OMI to assist law enforcement in criminal investigations where there is a death that has occurred?
A. One of the primary purposes of the OMI is to provide information to law enforcement personnel when they're investigating deaths. Yes.
Q. Is there a board that governs the OMI?
A. Yes. We do have a board.
Q. So do you know whether or not the head of the state police in New Mexico sits on that

governing board?
A. Yes.
MR. HUGHES: Object. It's a leading question.
THE COURT: Overruled.
Q. BY MS. DO: Have you testified -- prior to today, have you ever testified on behalf of a criminal defendant in a criminal matter?
A. Yes.
Q. And would you please tell us when that occurred.
A. And could you repeat the question one more time for me.
Q. Sure. Have you before today ever testified on behalf of a criminal defendant in a criminal matter?
A. I'm trying to think of the last time I did, the specific circumstances. I'm just blanking.
Q. Let me repeat the question --
A. All right.
Q. -- and let me backtrack a little bit. Have you ever testified in court as an expert in forensic pathology?
A. Yes.
Q. And how many times have you done that?

A. More than 50.
Q. And has that been on cause and manner of death?
A. Yes.
Q. When you've been called to testify as an expert in forensic pathology in cause and manner of death, are you primarily called by the prosecution or the defense?
A. Prosecution.
Q. And as you sit here today, do you remember an instance in which you have been retained by a criminal defendant to testify in a criminal matter?
A. Not that I've testified in. No.
Q. Okay. So just to clear that up, you work for the OMI, State of New Mexico, which has the primary function of assisting law enforcement agencies?
A. Yes.
Q. And the 50 times -- or the 50 or so times that you've testified as a forensic pathologist has been in cases in which you're called by the state or the prosecution?
A. That's correct. Yes.
Q. So you -- have you ever prior to today

been retained to testify on behalf of a criminal defendant in a criminal matter?
A. No. And I'm sorry. I misunderstood the question the first time.
Q. That's all right. In terms of civil matters, have you ever been retained?
A. Yes.
Q. And when you've been retained to testify in civil matters, that's, so the jury understands and I'm sure everyone knows, the difference between the criminal and civil is civil usually involves money; correct?
A. Yes.
Q. When you've been retained in a civil matter, have you testified more for the plaintiff or the defense, or how has that been divided?
A. My best recollection is they're divided equally. Typically I'll look at the circumstances surrounding the death if I'm consulted, and I make my determination upon that fact. I don't have a rule of working for plaintiff or defense in general.
Q. Okay. But you do review the circumstances and the facts before you agree to working on the matter?

A. Yes.
Q. Now, do you have a chief medical examiner in the Office of the Medical Investigator?
A. Yes.
Q. And what is his name?
A. Dr. Ross Zumwalt.
Q. At some point did Dr. Zumwalt approach you about this case?
A. Yes.
Q. And do you know how it was that Dr. Zumwalt came to learn of this case?
A. I believe he was contacted by your office.
Q. Okay. And was it through the chief medical examiner, Dr. Ross Zumwalt, that you then became involved in this case?
A. Yes.
Q. Now, I want to go over your education for the jury. Where did you receive your bachelor of science?
A. At George Washington University.
Q. And that's where?
A. In Washington, D.C.
Q. And do you have any other degrees after the bachelors of science?

A. Yes. I received a master's degree in science from Georgetown University in Washington, D.C.
Q. In any particular field?
A. Human physiology.
Q. And after you completed your master's of Science in human physiology, did you then go to medical school?
A. Yes.
Q. And where did you go to medical school?
A. At McGill University in Montreal, Quebec.
Q. That's in Canada?
A. Yes.
Q. And so you said you got your license in 1996. Was that the year you graduated from medical school?
A. Yes.
Q. Do you know whether or not McGill University of Medicine is ranked?
A. In comparison to other medical schools and universities, yes, it is.
Q. And where would it rank, sir?
A. So as a university in general, it's ranked in the top 25 universities in the world. As a medical school, it's the No. 1 medical school in

Canada.

Q. You currently live in the State of New Mexico?

A. Yes.

Q. Would you tell the jury why it was that you went to medical school in Canada, then?

A. My mother is from Montreal, and all of her side of the family is Canadian from Quebec or from Nova Scotia. I spent a lot of time in Quebec growing up and also Nova Scotia, and I wanted to go back there for university.

Q. Okay. Now, after you graduated from medical school, did you go on to complete a residency and/or fellowship?

A. Yes.

Q. Where did you do your residency?

A. Well, I did my internship in internal medicine at Brown University at the Miriam Hospital.

Q. And where is Brown University?

A. In Providence, Rhode Island.

Q. Would you tell the jury what internal medicine involved or encompassed.

A. Internal medicine is a general primary care specialty in medicine. And interns generally

have expertise in most natural disease processes of the body, heart, lungs. And so they would be one specialty that would encompass primary care.

Q. And during your internship in internal medicine at Brown University, did you see patients?

A. Yes.

Q. Did you do a fellowship or residency after that one year at Brown?

A. Yes.

Q. Where was that, sir?

A. I did a three-year residency at Boston University at Boston City Hospital in Boston.

Q. And in what field?

A. In emergency medicine.

Q. Would you tell the jury what emergency medicine involves.

A. Emergency medicine is another general specialty of medicine. And the primary purpose of an emergency medicine physician is to be able to manage -- or diagnose, treat, and manage acute illness as it comes in through the emergency department. So an emergency physician would generally have expertise in most areas of medicine.

Q. Would that include expertise and training in heat illnesses?

A. Yes.

Q. Would that include expertise and training in toxicity or poisoning?

A. Yes.

Q. You did three years there at the Boston Medical Center. During those three years did you treat patients?

A. Yes.

Q. After you completed your three years in emergency medicine, what did you do next?

A. I practiced for one year in emergency medicine at the Lahey Clinic in Burlington, Massachusetts.

Q. And was that as an attending doctor?

A. Yes.

Q. In any particular department at the Lahey Clinic in Massachusetts?

A. In the emergency department.

Q. As an ER doctor?

A. Yes.

Q. And in that one year did you also treat and see patients?

A. Yes.

Q. After you completed that one year at the Lahey Clinic in the emergency department, what did

you do next?

A. I went back to retrain in anatomic pathology at the Beth Israel Deaconess Hospital in Boston.

Q. And is the Beth Israel Deaconess Medical Center associated with any medical school?

A. Harvard University.

Q. How many years did you do your residency in anatomic pathology?

A. Three years.

Q. And during those three years of residency in anatomic pathology, did you conduct autopsies?

A. Yes.

Q. After you completed your three years at Beth Israel in anatomic pathology, what did you do next?

A. I went on to do one further year of training in forensic pathology in Albuquerque, New Mexico.

Q. And is that with the Office of the Medical Investigator where you're now employed?

A. Yes.

Q. Okay. So based upon what you just provided us, is it correct that you've done a total of five years in internal and/or emergency

medicine?

A. So I did one year of internship and three years of residency, so four years combined with those specialties.

Q. Okay. And then the additional year that you did at the Lahey Clinic as an ER doctor?

A. Working as an ER doctor. Yes.

Q. Okay. Do you have a license to practice medicine?

A. Yes.

Q. And where do you hold that license?

A. In the State of New Mexico.

Q. Do you have hospital admitting privileges?

A. No.

Q. Prior to you becoming a forensic pathologist -- let me ask you this question: Do most forensic pathologists have hospital admitting privileges?

A. Only if they're working in some other area of medicine. And in forensic pathology, we're obviously not admitting patients to the hospital. We're receiving them from the hospital. So anybody working as a forensic pathologist would not have admitting privileges. No.

Q. Prior to becoming a forensic pathologist, did you have hospital admitting privileges?

A. Yes.

Q. And that from your explanation is the ability to treat patients at hospitals?

A. Yes.

Q. You mentioned a few board certifications. You're board certified in forensic pathology?

A. Yes.

Q. Anatomic pathology?

A. Yes.

Q. Emergency medicine?

A. Yes.

Q. Now, the OMI is associated with the University of New Mexico. Do you have any teaching responsibilities for the university?

A. Yes.

Q. Would you tell the jury, please.

A. So teaching is really a major part of our job description at the University of New Mexico. One of the reasons that I went to New Mexico to train in forensic pathology is we have a large training fellowship in forensic pathology. We take four forensic pathology fellows each year who are doing additional training in that specialty.

I'm also the residency program director in the department of pathology, and we have 18 residents currently who are doing their residency in general pathology and also spending time with us in forensic pathology.

We also have a medical school at the University of New Mexico. And those medical students would come through our office. I also formally teach at the medical school. So I give three formal lectures pertaining to lung pathology.

Q. The lectures you give on lung pathology, does that include the subject of pulmonary edema?

A. Yes.

Q. And what specifically do you lecture in pulmonary edema on?

A. It's part of a lecture series that I do on obstructive and restrictive lung disease. Some components of restrictive lung decease include pulmonary edema and another entity called "ARDS" or acute respiratory distress syndrome.

Q. And you teach that three times a year to the medical students at the university?

A. Yes.

Q. Okay. We'll return back to that to explain to the jury what pulmonary edema is and

ARDS.

You've told the jury that you are trained in three areas of medicine. So are you what we would call cross-trained?

A. One way to look at it, yes.

Q. Is that a unique thing for a forensic pathologist, if you know?

A. I think it is. I don't know of any other forensic pathologist that has dual board certification in ER and forensic pathology.

Q. Does that give you any kind of additional advantage or experience training when you investigate a cause of death?

A. I think understanding clinical medicine can be very critical in many of the cases that we see in forensic pathology and at the Office of the Medical Investigator. So having a clinical background is certainly helpful in understanding disease processes, how they affect the body, and also in determining cause and manner of death.

Q. Is there a difference in the function of an ER doctor and a forensic pathologist?

A. Yes.

Q. Would you explain that to the jury.

A. An ER doctor, as I've mentioned earlier,

33

is that specialty that treats acute illness as it arrives through the emergency department. Typically the main goal of an emergency medicine physician is to make an accurate diagnosis and initiate treatment of that patient until that patient is either discharged from the emergency room or admitted to the hospital and given to another physician.

Forensic pathology is that specialty of medicine where we're looking at deceased individuals and doing investigations and performing autopsies to determine a cause of death.

So, in essence, we're both trying to make a diagnosis. We just do it in a different way.

Q. And because you're trained in both, you're able to draw on your experience as an ER doctor as well as your training and experience as a forensic pathologist?

A. Yes.

Q. As an ER doctor, did you ever -- were you ever called upon to determine medicolegal -- and could you tell the jury what that term is.

A. So those are medical cases that are of interest to the legal community either from a criminal or civil standpoint.

34

Q. For example, a homicide case?

A. Yes.

Q. As an ER doctor, did you ever have -- were you ever called to investigate a medicolegal cause of death?

A. Once.

Q. And when was that, sir?

A. That was probably my second year of residency. So 1998 probably.

Q. In terms of your experience as a medical examiner and forensic pathologist, could you tell this jury how many autopsies you performed in the seven years that you've been working as a forensic pathologist.

A. I have personally performed probably a thousand to 1,100.

Q. When you say "personally performed," are there additional autopsies that you've supervised?

A. Yes.

Q. And how many would those be?

A. Probably the same number. Approximately a thousand to 1100.

Q. How many medical examiners are employed within the department of the OMI?

A. Eight.

35

Q. And is there any sort of procedure or routine where you as a medical examiner working a case would present your case to the other seven?

A. Yes. That's an integral part of our daily schedule. Each day a particular forensic pathologist is on call, meaning that they're performing the autopsies that day. At 3:00 o'clock every day we sit down as a group in a large conference room and review every autopsy that was performed that day. Typically we'll review the scene photographs, photographs of the autopsy, and review the circumstances surrounding that death.

Q. And what kind of benefit do you get from that as a medical examiner?

A. There are two main benefits to that procedure. One is it's a -- acts as a quality assurance or quality control conference. But also we get to experience everybody else's cases. So not only do I have experience with my cases each year, I also see the majority of everybody else's cases as well.

Q. And in the course of hearing cases conducted by other medical examiners in your office, have you had the occasion to sit in on the presentation of a sweat lodge death?

36

A. Yes.

Q. And when did that occur?

A. In -- that occurred approximately two years ago, but I'd have to look at the exact date.

Q. Okay. And we'll revisit that to go into the circumstances.

You're obviously retained here on a private matter -- or privately retained here by a criminal defendant for the first time; correct?

A. Yes.

Q. Could you explain to the jury how it is that a medical examiner employed for the State of New Mexico is permitted to consult on matters outside of its department.

A. It is part of our department as well as institutional policy that we can pursue private consults that we perform on our own time. So it's a common practice within the office. Many of the forensic pathologists will pursue and perform private consultation.

Q. Do you advertise?

A. No.

Q. And do you know how it is that cases come to the OMI, then? Is there a reputation?

A. As I said, many of us do private

consultations, from the chief medical examiner down to the most junior person in the office. The office has a reputation of performing that service and performing it well. And it's not unusual for Dr. Zumwalt to receive many calls concerning consultations.

Q. Dr. Paul, in terms of your experience with heat-related illnesses, during the five years total of internal and emergency medicine, your residency, and the time you spent in the ER at the clinic, have you treated heat illnesses?

A. Yes.

Q. Have you treated nonexertional heat stroke?

A. No.

Q. Okay. So when you say "heat illnesses," could you tell the jury what the range of disorders or diseases in that field that you've treated.

A. In heat -- heat illness can really be looked at as a spectrum of disease. The mildest form would be considered heat exhaustion, and the most severe form would be considered heat stroke. I've seen heat exhaustion many times, and -- but I don't remember a particular circumstance where I've treated actual heat stroke.

Q. Do you have training, though, in that area?

A. Yes.

Q. In the -- I believe you gave us a range of about a thousand of your autopsies. Have you ever conducted an autopsy in a heat-related death?

A. Yes.

Q. How many times?

A. Probably 10 to 12 times.

Q. And generally what were the circumstances involved in those 10 to 12 cases?

A. Those circumstances were typically that the -- somebody crossing the border from Mexico into New Mexico. And it's not terribly uncommon for us to find people who have died of heat-related illness just north of the border in Southern New Mexico.

Q. Sort of similar to what's been described as the situation here in Arizona?

A. Yes.

Q. Have you, in addition to personally performing 10 to 12 heat-related deaths, also sat in on other heat-related deaths presented by other medical examiners in your department?

A. Yes.

Q. How many times?

A. And, once again, I think that I at least heard presentations on at least 12 or 10 others, probably more than that. But that would be the minimal number that I was exposed to.

Q. And that would include that sweat lodge death you referred to?

A. Yes.

Q. Now, let me give the jury a little bit of background on how it was and when it was that you became involved in this case. You were approached by your chief medical examiner, Dr. Zumwalt?

A. Yes.

Q. And were you asked if you were interested in this case?

A. Yes.

Q. Do you remember then after that speaking to me?

A. Yes.

Q. Was that by telephone or in person?

A. Telephone.

Q. Do you remember when approximately that occurred?

A. April of 2010.

Q. Okay. And in that conversation, do you

recall me providing you with any background information in this case?

A. Yes.

Q. What did I provide you with?

A. The very basics of this case, that there were deaths involved with sweat lodge exposure, some of the basic signs and symptoms. And you asked me if I would be interested in reviewing the circumstances and evidence to come to a conclusion as to cause of death.

Q. And after we had that conversation, did you then sign or provide us with a copy of a retainer agreement?

A. Yes.

Q. And do you recall that occurring on May 4, 2010?

A. Yes.

Q. Now, you obviously are paid for your time?

A. Yes.

Q. And how much do you bill per hour?

A. $400.

Q. The jury heard from a Dr. Dickson, who is privately retained by the state. And that's also his billing rate. Is that some sort of standard in

the industry?

A. It would be a common amount, and it's also a standard amount that we use in the office for all the forensic pathologists.

Q. Okay. So of the -- all the eight medical examiners that are employed for the State of New Mexico, if you privately consulted, the rate is 400?

A. Yes.

Q. Now, after you were retained on this matter and asked to review, were you asked to review the state's evidence in this case?

A. Yes.

Q. After you were retained and asked to review the state's evidence, did my office then provide you with materials and documents to review?

A. Yes.

Q. Let me go through what was provided to you, Dr. Paul. I'm going to hand you a number of exhibits.

Were you provided with documents and materials related to Kirby Brown?

A. Yes.

Q. And what I have in front of you are those exhibits, 370, 373, and 374. There are stickers on

the back?

A. Yes.

Q. And would those exhibits that relate to Ms. Brown include her autopsy report, autopsy notes, and medical records from the Verde Valley Medical Center?

A. Yes.

Q. Did I also provide you with documents -- state's evidence on James Shore?

A. Yes.

Q. And looking at the second stack, does that have Exhibit 375, 378, and 379?

A. Does it have to be such small print? Yes.

Q. And do those exhibits include Mr. Shore's autopsy report, autopsy notes, and medical records from the Verde Valley Medical Center?

A. Yes.

Q. Did I also provide you with documents and materials related to Ms. Neuman on or about May 6?

A. Yes.

Q. Okay. And are those exhibits --

If I may approach, again, Your Honor?

THE COURT: Yes.

Q. BY MS. DO: The autopsy report. And it's

Neuman Exhibit 362; her notes, 363; and a set of medical records from the Flagstaff Medical Center, Exhibit 580; and the Guardian Air, which is the EMS records, Exhibit 369?

A. Yes.

Q. If you could pay particular attention to Exhibit 580. Do you recall that being the first set of medical records pertaining to Ms. Neuman that was provided to you on the date of May 6?

A. I believe that's correct, yes, from my best recollection.

Q. And once you received those records as to Ms. Neuman, did you determine whether or not it appeared to be complete or incomplete?

A. In -- for Ms. Neuman it appeared to be incomplete.

Q. And when you determined that they appeared to be incomplete on the date of May 6, did you make a request of my office?

A. Yes.

Q. And what was that, sir?

A. To have the complete medical records.

Q. And, to your knowledge, was that request made of the state and complied with?

A. I did receive eventually the complete

medical records. Yes.

Q. Okay. I'm going to approach you with four volumes: Exhibit 365, Exhibit 366, 367, and 368. Were those the additional records of Ms. Neuman's medical treatment that was provided to you after you made the request?

A. Without looking at each individual page, it appears to be the complete medical records of Liz Neuman. Yes.

Q. Okay. You also brought your copies with you?

A. Yes.

Q. Now, did you receive -- and I believe if I counted that correctly, those four volumes, exhibits 365 to 368, is an additional 1,392 pages. Did you receive those 1,392 pages on or about May 19, 2010?

A. I don't remember the exact date. But that sounds --

Q. Okay.

A. I just don't remember the exact date. I'm sorry.

Q. That's fine. Any reason to dispute that?

A. No.

Q. So as far as you know, reviewing the

autopsy report, you understood that the medical examiners -- in this case the medical examiners for the state had issued their autopsy reports on everyone, including Ms. Neuman, on February 2nd, 2010; correct?

A. Yes.

MR. HUGHES: Object to the leading nature of the question.

THE COURT: Overruled.

Q. BY MS. DO: Is that correct?

A. Yes.

Q. And the medical records -- the complete medical records you received pursuant to the defense's request of the state on or about May 19 --

A. That sounds correct.

Q. -- 2010?

A. Yes.

Q. I guess I can pull out this chart. As we're going to go through, did it appear to you that these medical records were voluminous?

A. Very.

Q. And ultimately in this case, how many pages of records were provided to you to review?

A. I think over 5,000.

Q. And did you understand that those 5,000 pages were the state's evidence?

A. Yes.

Q. In order to assist the jury through your testimony today and what you reviewed in the medical records, did you help prepare a chart summarizing key medical facts for each of the participants and the decedents that were hospitalized?

A. Yes.

Q. And what's behind you -- I asked them to make it big, and they kind of went overboard. This is a blow up of the summary that you're referring to; correct?

A. Yes.

Q. I'm going to give you a copy of that chart, which the clerk has marked as Exhibit 1083. And if you would, looking at Exhibit 1083, tell the jury whether or not that is the same copy that is blown up on this giant board behind you.

A. Yes.

MS. DO: And I think there has to be one correction. We'll get to it. Luis is going to help me get this out.

Your Honor, may I inquire if the jury can

see the board?

THE COURT: Thank you.

They're all nodding yes as far as I can see.

MS. DO: Thank you.

Q. So what we've just gone through and so the jury understands the summary, we talked about the medical records and the autopsies documented as it relates to Ms. Brown, Mr. Shore, and Ms. Neuman?

A. Yes.

Q. And on this Exhibit 1083, that would be patients No. 1, 2, and 4?

A. Yes.

Q. And at the very last column, did we designate the exhibit numbers from which the medical data comes from for the jury's convenience?

A. Yes.

Q. All right. Did I also provide you in May of 2010 with medical records of a Stephen Ray?

A. Yes.

Q. I'm going to hand you what's been marked as -- I'm sorry. Let me go back to 580. Did you review the first set of medical records as it pertains to Ms. Neuman when you received it?

A. Yes.

Q. And did you rely on that to reach any opinions or conclusions in this case?

A. I utilized the entire medical record. But I did draw conclusions from the initial medical records as well. Yes.

Q. Okay. And from the first page, does it appear to you that this came from the state with a certification by a Detective Pam Edgerton?

A. Yes.

MS. DO: Your Honor, I'd ask to move Exhibit 580 into evidence.

MR. HUGHES: May I see it?

MS. DO: Oh. I'm sorry.

MR. HUGHES: Your Honor, I believe these records are already in evidence under a different exhibit number.

THE COURT: Well, there could be some duplication.

But any objection to these?

MR. HUGHES: Other than cumulative, Your Honor.

THE COURT: Okay. It's organized in this fashion.

Overruled.

We can look at straightening out rather

than having two copies going to the jury.
But 580 is admitted.
(Exhibit 580 admitted.)
MS. DO: Thank you, Your Honor.
Q. And I just want to go through this so the jury understands what records were provided to you and in what order.
Were you also provided with Exhibit 581, which is the -- what appears to be about 38 pages of Stephen Ray's medical records?
A. Yes.
Q. And when you reviewed Mr. Ray's medical records, did you determine in May of 2010 that they appeared to be complete or incomplete?
A. Incomplete.
Q. And what did you do after you determined that they were incomplete?
A. I requested the entire medical records of Stephen Ray.
Q. And who did you make that request to?
A. Yourself.
Q. And after you made that request, to your knowledge, was that request forwarded to the state?
A. Yes.
Q. And did you, after making the request for

Mr. Ray's complete medical records, receive that?
A. Yes.
Q. Did you, however, review the medical records of Stephen Ray that is marked 581?
A. Yes.
Q. And on the first page do you see a certification that comes from the Flagstaff Medical Center?
A. Yes.
Q. At the bottom of each of these right-hand corners, do you see a Bates stamp?
A. Yes.
Q. Does that indicate to you that those records came from the state?
MR. HUGHES: Object to the leading nature, Your Honor.
THE WITNESS: I believe so. Yes.
THE COURT: Sustained. Sustained.
Q. BY MS. DO: All right. Do you recognize the Bates stamp numbering system?
A. Yes.
Q. And based upon your recognition of that, do you know which parties originated those records?
A. My guess is that -- I don't know for sure.

Q. All right.
A. But it's my understanding that that's the state evidence number.
Q. All right. And did you once receiving 581 review it and rely on it to reach any opinions or conclusions in this case?
A. The initial medical records?
Q. Yes.
A. No. They were incomplete and all the data was not present. And I did not draw any conclusions from those medical records.
Q. Okay. And that's a set you received in May of 2010?
A. Yes.
Q. When did you -- did you write a report in this case?
A. Yes.
Q. When did you write that report?
A. It's dated January 10 of 2011.
Q. So as of January 10, 2011, were those the only records you had for Stephen Ray?
A. Yes.
Q. Do you know a Dr. Dickson in this case?
A. I know of him. Yes.
Q. And how do you know of him?

A. I've read reports that he generated as a consultant in this case. And I've also read transcripts of his testimony in this case.
Q. Okay. And do you recall whether or not Dr. Dickson issued his report on or about the date of January 18, 2010 --
A. That --
Q. -- 2011?
A. That sounds correct. But I would have to look at my records.
Q. Okay. I'm going to show you Exhibit 213, which is in evidence, and also Exhibit 214. Are those the complete medical records for Stephen Ray that you received after you initiated the request?
A. Yes.
Q. And is that accurately reflected on our chart 1083 in row No. 3?
A. Yes.
MS. DO: Your Honor, the defense also moves into evidence Exhibit 581.
THE COURT: Mr. Hughes?
MR. HUGHES: Your Honor, again, I object on cumulative. They're the same records or at least a subset of the records that are already in evidence in Exhibits 213 and 214.

MS. DO: Your Honor, there is an independent reason for submission.
THE COURT: 581 is admitted.
(Exhibit 581 admitted.)
MS. DO: Thank you.
Q. When you received the complete medical records for Mr. Ray, which are reflected in Exhibit 213, did it appear to you that there was additional information that was significant to any opinions or conclusions that you reached --
A. **Yes.**
Q. -- that were not contained in the original set that was provided to you in May of 2010?
A. **Yes.**
Q. To complete this line, I'm going to hand you this whole stack and ask you if you also received the medical records for Sidney Spencer, which is Exhibit 222?
A. **Yes.**
Q. The medical records for a Tess Wong, Exhibit 396?
A. **Yes.**
Q. The medical records for Lou Caci, Exhibits 175 and 176?

A. **Yes.**
Q. The medical records for Dennis Mehravar, Exhibits 192 and 193?
A. **Yes.**
Q. The medical records for Sean Ronan, Exhibits 392 -- 392 and 393?
A. **Yes.**
Q. The medical records for a Kristina Bivins, Exhibits 384 and 385?
A. **Yes. But I don't see those records here -- 384 and 385.**
Q. For Kristina Bivins?
A. **Uh-huh.**
Q. Let me approach again. This is 386 and 387. I'm sorry. Is that Kristina Bivins' medical records?
A. **Yes.**
MS. DO: May I have one moment, Your Honor?
THE COURT: Yes.
Q. BY MS. DO: Okay. And then I'm handing you the rest. Did you also receive the medical records for a Sandra Andretti --
A. **Yes.**
Q. -- Exhibits 384 and 385?
A. **Yes.**

Q. The medical records for a Kim Brinkley, Exhibits 167 and 168?
A. **Yes.**
Q. The medical records for a Robert Grain, Exhibits 388 and 389?
A. **Yes.**
Q. The medical records for Linda Andresano, Exhibits 151 and 152?
A. **Yes.**
Q. The medical records for Ami Grimes, Exhibits 390 and 391?
A. **Yes.**
Q. Okay. And this is where I think we need to make a correction. On the chart that you have that's been marked as Exhibit 1083, do you see a correction there where we corrected 389 to 390?
A. **Yes.**
Q. I'm going to do the same on this chart.
Did you also receive the medical records for Melissa Phillips, Exhibits 203, 204?
A. **Yes.**
Q. And the medical records for Brandy Rainey, Exhibits 208, 209; and Linnette Veguilla, Exhibits 394, 395?
A. **Yes.**

Q. In addition to these medical records, which you have a stack of it in front of you, did you receive other documents that came from the state's case?
A. **Yes.**
Q. And I --
A. **I'm trying to keep up with you here.**
Q. I'm sorry.
A. **I'm trying to keep up with you on all the records here.**
Q. Okay. Tell me if you want me to slow down.
In total, you said you reviewed over 5,000 pages of records?
A. **Yes.**
Q. And how many hours have you spent on this case, then, sir?
A. **Between 80 and 90 hours currently.**
Q. And those 80 and 90 hours would consist primarily of what?
A. **Record review, research, and telephone consultation as well as travel.**
Q. Okay. And did the time also include the time that you flew out to sit down for a state interview with Mr. Hughes?

A. Yes.
Q. Okay. We're going to refer back to this summary. But does this summary assist you in explaining to the jury some of your opinions and conclusions in this case that you reached in reviewing the medical records?
A. Yes.
Q. And I want to give the jury a guidepost or some kind of a road map to understanding your opinions and conclusions, and then we'll go back through and fill in some of the details. And to assist the jury in that, I'm going to use this easel.
All right. Dr. Paul, in reviewing the medical records of all 18 of these patients, did you reach an opinion as to whether or not any of them showed signs or symptoms of heat exhaustion?
A. Yes.
Q. Would you tell the jury what that opinion is.
A. I believe that many, if not all, of the patients that you see on the chart here had some signs and symptoms of heat exhaustion.
Q. And what are those signs and symptoms?
A. The most common ones are nausea,

vomiting, headache, and in some cases syncope or passing out.
Q. Is syncope also fainting?
A. Yes.
Q. So many or all of the participants or patients -- I'm sorry. Many or all of the patients that you reviewed records on showed signs and symptoms for heat exhaustion?
A. Yes.
Q. In reviewing the medical records of these 18 patients, did you see evidence that was consistent or inconsistent with the cause of death being heat stroke or the cause of the critical illnesses being heat stroke?
A. No.
Q. And that would include Ms. Brown?
A. Yes.
Q. Mr. Shore?
A. Yes.
Q. Ms. Neuman?
A. Yes.
Q. And the critically ill of Ms. Spencer, Ms. Wong, and Mr. Ray?
A. Yes.
Q. Are there objective medical data that you

would look for in determining whether or not we're looking at heat stroke?
A. Yes.
Q. And we'll go through it again. But could you tell the jury what those components are.
A. The three main diagnostic components of heat stroke are elevated temperature, the patient loses the ability to sweat, and also dehydration. And dehydration can be objectively measured using laboratory tests, and we can go through that.
But particularly looking at kidney function -- and I'll talk about BUN and creatinine as markers of kidney function. Also by measuring the body's electrolytes, particularly sodium. In significant dehydration the sodium is elevated above normal.
Also you can objectively measure someone's temperature. So we do have objective measures of the diagnostic components of heat stroke.
Q. Okay. So when you reviewed the medical records of these 18 patients, did you see objective medical data to support a conclusion that Ms. Brown, Mr. Shore, or Ms. Neuman died of heat stroke?

A. No.
Q. Or that Mr. Ray, Ms. Spencer, or Ms. Wong were critically ill due to heat stroke?
A. No.
Q. And when you say you didn't see objective medical data, can I refer to that as "clinical evidence"?
A. Yes.
Q. And you said one component is a recorded core temperature?
A. Yes.
Q. And what is that core temperature?
A. In -- the literature will give various temperatures as a cutoff for heat stroke. But the -- probably the most common cut-off number in the literature is 105 degrees Fahrenheit.
Q. And did you see records -- or evidence in the medical records of anyone with a recorded temperature of 105 degrees Fahrenheit?
A. No.
Q. You also indicated that dehydration is a component of heat stroke. Now, dehydration -- I assume there is mild, there is severe dehydration?
A. Yes.
Q. Is it any dehydration, or is it a

61

particular level of dehydration that you would see in heat stroke?

A. You really need severe dehydration to cause some of the symptoms that we see in heat stroke.

Q. And we'll go through and explain that.

In reviewing the 18 patients' records, did you see any evidence of severe dehydration?

A. No.

Q. And the other one you said was the inability to sweat. Is there a medical term for that?

A. Anhidrosis.

Q. And did you see any clinical medical evidence of anhidrosis in any of the 18 patients you reviewed?

A. No. And it's -- it's mixed. And if you go through the medical records, some patients are described as being -- having dry skin, but some of the critically ill patients are described as having either clammy or wet skin. And so there is really no evidence that particularly the critically ill patients were presenting uniformly with dry skin or anhidrosis.

Q. Okay. And we'll go through it again.

62

So you, in reviewing these medical records, determined that you did not see any clinical or medical evidence of heat stroke; that is, no evidence of a core temperature of 105 degrees Fahrenheit or higher, no evidence of severe dehydration and anhidrosis?

A. Right.

Q. Did you see anything in the medical records by way of clinical medical evidence that was inconsistent, not just unsupported of heat stroke, but inconsistent with heat stroke?

A. Yes.

Q. And could you list those for us. And then we'll go through it in detail.

A. So the first one was the record of respiratory failure or respiratory distress that the critically ill patients experienced as well as described in both the EMS as well as emergency room records.

Q. What else?

A. Mental status changes or changes in mentation or thinking. And all of the critically ill patients are described as being virtually comatose and requiring intubation to maintain their breathing efforts.

63

Q. This jury has heard evidence or testimony from several other doctors in this case, the two medical examiners. Dr. Cutshall -- you've seen that name?

A. Yes.

Q. Do you know whether or not he treated Ms. Neuman at the Flagstaff Medical Center?

A. Yes.

Q. They also heard from a Dr. Dickson. So the jury has heard you can see respiratory failure and altered mental status in heat stroke.

Was there something specific here that led you to believe that these two factors were inconsistent with heat stroke?

A. It is a true statement that you can see respiratory failure in heat stroke. The key component is when you will see the respiratory failure in the course of the illness. With heat stroke it would be very unusual to have fluid buildup in the lungs or pulmonary edema early on in the course. The reason that is is -- principally is because these patients are significantly dehydrated. They've already lost a lot of water in their body. Their volume has decreased, and they don't have the fluid to excrete into the lungs.

64

So a lot of the respiratory distress in the heat that we see here in the critically ill patients is probably attributable to pulmonary edema. And so that's -- you don't see that early in the course of heat stroke. But when you do see it is when these patients arrived at the emergency room and they're giving large amounts of fluid. Eventually, once they're rehydrated and they're given too much fluid, that fluid can leak into the lungs and cause respiratory distress or pulmonary edema at -- at that point.

Q. Let me stop you there, Dr. Paul. Because this information is a lot, and I don't want to just inundate the jurors with it. I just want to give them a guidepost --

A. Uh-huh.

Q. -- and then we'll go back through.

So was it that you saw respiratory failure and pulmonary edema early in the presentation of these patients that you believe is inconsistent with heat stroke?

A. Yes.

MR. HUGHES: Object to the leading nature of the question.

THE COURT: Sustained.

Q. BY MS. DO: Okay. I'm trying to summarize what you just said. What was it about the respiratory failure and the pulmonary edema that you saw in the presentation of these patients that led you to believe that it was inconsistent with heat stroke?

A. When it occurred. And in these patients, all of them experienced respiratory distress very early on in the course. So they were found by EMS to have difficulty breathing and also experiencing pulmonary edema. So that's inconsistent with heat stroke.

Q. Okay. And also with coma or comatose -- the jury has heard that you can see it in heat stroke and you can also see it in -- and we'll talk about it -- organophosphate toxicity.

Was there something here specific about the presentation of coma or comatose in the patients that led you to believe that it was inconsistent with heat stroke?

A. Yes.

Q. And what was that?

A. And -- in heat stroke the changes in mental status or the changes in mentation or the -- or developing or experiencing coma really is caused

by a couple of different factors:

One is due to the severe dehydration. When you get -- electrolytes can become very concentrated in the blood, like sodium, as I talked about before. That can cause changes in mentation or thinking and even cause a coma.

So in nonexertional heat stroke, having severe dehydration can cause mental status changes or changes in mentation. So in none of the patients here do we have any evidence of severe dehydration. So we know that's not a cause of their mental status changes.

The other way you can get -- you can become comatose with heat stroke is the direct effect of heat on the brain. It can kill brain cells. And as you kill more and more brain cells, you become more and more obtunded and more difficult -- difficulty with mentation, and eventually you can become comatose.

The thing about killing brain cells is you can't regenerate those brain cells. So once you start injuring brain cells, you don't recover fully from that -- from that event.

In this case we know they were comatose early -- early on in their course. We know they

weren't dehydrated. So that's not a reason for them to be -- to have a change in mental status. And the ones that were comatose that recovered recovered fully. There was no evidence at all of brain damage. So it's very unlikely that they're comatose state was induced or caused by heat stroke.

On the flip side, there is some toxicity, such as organophosphates, that can induce a comalike state that's easily reversible over time. As the drug or toxin wears off, they wake up and they experience no long-term effects from that exposure.

Q. Okay. And I think we're going to review that again.

So was it the timing of the onset of coma or comatose stage that you found inconsistent with heat stroke?

A. Not only the timing, but more important, the lack of laboratory data to suggest that this was associated with dehydration or electrolyte abnormalities.

Q. Okay. You also mentioned something -- and I want the jury to understand which particular patients you're referring to when you talk about

early respiratory or pulmonary edema or early comatose, coma stage. Are you including in that the critically ill of Mr. Stephen Ray?

A. Yes.

Q. Ms. Sidney Spencer?

A. Yes.

Q. Ms. Wong?

A. Yes.

Q. Would you consider either of these stages transient? And do you understand what I mean when I say "transient"?

A. Yes.

Q. Okay. Could you explain to the jury if what you saw in the medical records for those three critically ill patients -- Mr. Ray, Ms. Spencer, Ms. Wong -- did you see evidence of transient respiratory failure and transient comatose stage?

A. Yes. And what that means is that although they developed respiratory failure and also were in a relative comatose state, they fully recovered. There was no long-term effects from either of those processes, so it was short lived or transient.

Q. Okay. So in addition to early transient respiratory failure, pulmonary edema, and early

transient comatose stages for the critically ill, were there any other medical or clinical evidence that you saw in these records that were inconsistent, not just unsupported, but inconsistent with heat stroke?

A. There's one other that there was a documented blood pressure of Liz Neuman during her initial evaluation in the hospital. And her systolic blood pressure was 204 millimeters of mercury. Normal blood pressure -- really the high end of systolic is about 120 to 130.

In heat stroke you're becoming more and more dehydrated, and the common presentation would be of someone who has a low blood pressure. So having a high blood pressure is inconsistent with heat stroke.

Q. Okay. In addition to those three factors, and the one specifically for Ms. Neuman, the high blood pressure -- and, again, I just want to establish a road map for the jury, and we'll go back through and explain it in more detail -- was there any other factor or clinical medical evidence in the records that you saw inconsistent with heat stroke?

A. I believe that's it.

Q. Okay. Now, these factors are inconsistent with heat stroke. Are they consistent with some other process that's going on?

A. Yes.

Q. And what is that, Doctor?

A. Well, the other -- actually, the other thing that we should put on this list is the size of the pupils of the critically ill patients, and that hasn't been added.

Q. Okay. And what about the size of the patients' pupils?

A. The critically ill patients who were evaluated at the hospital all had very small pupils or what we call "miotic pupils." As an ER doc or as a physician in general, we're trained to evaluate the eyes, and especially the pupils, when you're looking at critically ill patients. It can give you a very quick clue as to what might be causing illness or the presentation of this particular patient.

Probably the most common cause of a pinpoint or small pupil is a narcotic overdose, things like heroine or other painkillers. So recognizing that very early on can facilitate rapid treatment and rescuing the patient.

In this case I think it's remarkable that all four of the critically ill patients had pinpoint pupils. It's an unusual finding. And apart from narcotic opiates, the list of things that cause pinpoint pupils is not that long.

One of the toxins that is well-known to cause pinpoint pupils are organophosphates or related pesticides. And they do that -- it's not 100 percent, but certainly the vast majority, 80 to 85 or higher percent of patients, who initially present with organophosphate toxicity or other similar pesticide will have pinpoint pupils.

Q. Okay. And when you say that the four critically ill patients had pinpoint pupils, referring back to our chart here, are you including in that Mr. Ray?

A. Yes.

Q. Are you including in that Ms. Neuman?

A. Yes.

Q. Ms. Spencer?

A. Yes.

Q. And Ms. Wong?

A. Yes.

Q. And that's documented in the medical records?

A. Yes.

Q. So if these four factors are inconsistent with heat stroke, are there -- are they consistent with another disorder?

A. Yes.

Q. And what are they consistent with?

A. They're all consistent with organophosphate or similar toxic exposure.

Q. Have you ever heard of the term "toxidrome"?

A. Yes.

Q. Could you tell the jury what that is.

A. So a toxidrome is a constellation of signs and symptoms that are common to a particular exposure. So if we look at the toxidrome of an opiate overdose or a heroine overdose, the two things that would be most important would be a miotic or small pupil and difficulty breathing and a slow respiratory rate. That would be the toxidrome for a heroine overdose.

A toxidrome for organophosphate toxicity would be, once again, the small pupils, mental status changes, hyperactivity of the bowels, hyperactivity of the glands of the bodies. So there is a number of different signs and symptoms

that would be not specific but consistent with organophosphate toxicity.

Q. And is there a medical term for that toxidrome that includes organophosphates?

A. Well, it's organophosphate class, but I'm not sure what you're referring to.

Q. Have you heard of anticholinergic and cholinergic?

A. The general -- right. The general term would be "cholinergic toxicity."

Q. Okay. So summarizing your opinions and conclusions, based upon your review of the medical records, are you able to exclude organophosphate toxicity as a cause of death in this case?

A. No.

Q. And, finally, are you sitting here today telling the jury that you know what killed Mr. Shore, Ms. Brown, or Ms. Neuman?

A. No.

Q. Then explain to them what your conclusion or opinion is in this case if you're not telling them what killed these people.

A. I think it's -- I think it's unclear at this point. What I will say is that from what I've described so far and after reviewing the entire

medical records that the data to support heat stroke is not present in the medical records.

What I find compelling in this case is that all the critically ill patients had the -- had very similar signs and symptoms and presentation in the emergency room. And all of those signs and symptoms are consistent with something like organophosphate or pesticide toxicity.

The reason I don't -- I can't come to a definitive conclusion in this case is because testing for organophosphates or similar compounds was not done in a timely fashion, if at all, in this case to make that diagnosis.

Q. And in reaching your opinions and conclusions that we've summarized up there, Dr. Paul, are you in any way criticizing the investigation conducted by Dr. Lyon or Dr. Mosley?

A. No.

Q. Are you in any way criticizing the treatment received by Ms. Neuman or any of these patients?

A. No.

Q. Now, I'm going to go through -- now that we have a road map, go back through some of this. You had mentioned to the jury that one of the

heat-related deaths that your office investigated was a sweat lodge death.

A. Yes.

Q. And you understand in this case obviously the deaths occurred in connection to a sweat lodge ceremony?

A. Yes. I think it's unfair to call it a "sweat lodge death," though --

Q. Okay. Correct me.

A. -- because of the circumstances. And -- which I can explain whenever you like.

Q. Okay. I would love for you to do that.

Before we do that, could you tell the jury, because we're going to talk about sweat lodges, if you have any personal experience with sweat lodges?

A. One. And that's when I was a teenager on a trip that I built one. And it wasn't terribly dissimilar in structure to the one we're talking about today -- using plastic tarps as the cover and underlying wood frame. And we heated the sweat lodge in exactly the same fashion. Rocks were superheated outside the sweat lodge, brought in, and water was poured over the rocks. And we did spend a considerable amount of time within that

sweat lodge --

Q. And when you say --

A. -- during that trip.

Q. I'm sorry. When you say "we," who are you referring to?

A. I was on a canoeing trip with actually 18 other people. But four of us were participating in that sweat lodge event.

Q. And this canoeing trip was where?

A. In Alaska.

Q. And that was when you were a teenager?

A. I was about 16.

Q. Okay. In addition to reviewing the medical records in this case, you mentioned that you had done some research?

A. Yes.

Q. Did you research into the medical literature as it relates to deaths in connection with sweat lodges?

A. Yes.

Q. And is that the type of information and material that you, as an expert, as a medical examiner, would look for and rely on?

A. Yes.

Q. Did it help you in forming your opinion

in this case?
A. Yes.
Q. In researching the medical literature for deaths occurring in connection with sweat lodges, did you find many or a few? Can you quantify it?
A. There is actually not much literature at all concerning sweat lodge deaths. Most of the literature concerning these types of deaths comes out of Scandinavia concerning sauna and death and deaths that occur within Scandinavian saunas. And it doesn't easily translate to the circumstances we have here because many of those deaths occurred in people who were consuming alcohol or intoxicated with alcohol or had significant underlying medical conditions.
Q. And you didn't see any evidence in here that any of these patients or the decedents had consumed alcohol or other drugs?
A. That's correct.
Q. In researching the medical literature for deaths in connection with sweat lodges, did you find anything that was similar?
A. Yes.
Q. And where did that occur and when did it occur?

A. There was an article that was published out of Australia. And it was published in one of our national association journals. I'd have to refer to the journal to get the exact date of publication. I don't know if you have that handy.
Q. That's okay. Let me ask you this: That journal -- is it a reputable journal?
A. Yes.
Q. Is it a journal that medical examiners such as yourself would rely on?
A. Yes.
Q. And do you recall at this time, without referring to the actual article, what the circumstances were in that Australian death?
A. Yes.
Q. Would you please tell the jury if in reviewing that sweat lodge death that was reported out of Australia -- first of all, was an autopsy done?
A. Yes.
Q. Do you remember the age of the decedent?
A. 37.
Q. Male or female?
A. Male.
Q. And by the autopsy that was reported, was

that 37-year-old male -- what physical condition was he in prior to the sweat lodge?
A. Healthy.
Q. And in that case of a 37-year-old male who died -- and I assume that was -- do you know the circumstances of the sweat lodge ceremony itself?
A. I know the circumstances as they're described in the journal. And they talk about the sweat lodge that's used and -- what I don't have, though, is the essential time frame that they're present within the sweat lodge. But the two -- there were two gentleman that were involved in this case. One was a 30 year old, and one was a 37 year old. They had been part of a sweat lodge ceremony in the outback of Australia.
Bystanders had described them as fasting, limiting -- in particular limiting their water intake over the two days that they were doing their sweat lodge ceremony. And at some point during the ceremony, they became -- they began to experience mental status changes -- confusion, disorientation, those symptoms that we've talked about before.
When bystanders noted that they were having trouble with their mentation and thinking

and were becoming obtunded, they were transported to a local hospital. The gentlemen -- they were both significantly dehydrated when they showed up to the hospital. The 30 year old was rehydrated and did well. There were no long-term consequences or sequela that were described in the article.
But the 37 year old died shortly after arriving to the emergency department. An autopsy was done in that case in Australia, and one of the things that autopsy demonstrated was severe dehydration. He had a sodium -- I believe the figure was 156 millimoles. And that's well above the normal cutoff, which is around -- between 140, 143 would be the high end of normal.
So this is a gentleman who had severe dehydration at the time of autopsy. They also looked for other things like carbon monoxide and other toxins, and those were not present in this case.
Q. And the severe dehydration that was found in the 37-year-old male who died after participation in that sweat lodge, was that by clinical medical evidence?
A. Yes.
Q. Would that have included a test of the

vitreous fluid?
A. Yes.
Q. Could you tell the jury what a vitreous fluid testing is.
A. On autopsy we can test eye fluid for many different things. One are electrolytes. And the other thing we -- we typically use vitreous eye fluid for is for toxicology testing or testing of toxins and drugs and medications.
The unique thing about bodies after they die is that many blood tests generally are unreliable because the body starts breaking down shortly after death. So electrolytes can be very different after death than before death.
The nice thing about vitreous eye fluid is that it remains relatively stable for many hours after death. .so you can test the vitreous eye fluid for things like sodium and other electrolytes. And it will give you a good idea of what the -- what that concentration was right before the decedent died.
Q. Is that used as the gold standard to test for dehydration or electrolyte disturbances in autopsies?
A. Yes.

Q. In this case did you see evidence that a vitreous test was conducted on Ms. Brown and Mr. Shore?
A. Yes.
Q. And from those vitreous testing, did you see evidence of any dehydration?
A. No.
Q. All right. So Dr. Lyon, who autopsied those two decedents, testified to this jury and stated that it was his opinion -- and you can assume this hypothetically because you weren't here -- that it was his opinion that the vitreous established conclusively that Mr. Shore and Ms. Brown were not dehydrated at the time of death.
Would you agree with that?
A. Yes.
Q. Let me hand you the article that you've been referring to. And is this a publication out of Australia in the American Journal of Forensic Medicine and Pathology dated March 2005?
A. Yes.
Q. So it's an Australian case but reported in an American medical journal?
A. Yes.
Q. And, again, that's something that you

find reputable that you would rely on?
A. Yes. This is a publication that's issued by our main national organization, the National Association of Medical Examiners. And that association has many worldwide members, so it would be a common forum for them to present their interesting cases.
Q. Are you a member?
A. Yes.
Q. Now, the severe dehydration that occurred in this particular case that we're talking about -- did you see in this article, the autopsy information, whether or not there had been any attempts prior to his demise to give him IV fluids, if you know?
A. I don't recall. And I'd have to look in the article.
Q. Do you want to do that?
A. Yes.
Q. And actually did you summarize that also in your report?
A. Yes.
Q. Let me hand you what's been marked as Exhibit 1000. Is that your report dated January 10, 2011?

A. Yes.
Q. And if you want to refer to the summary, can you tell me whether or not the 37 year old who died with evidence of severe dehydration -- did he receive any IV fluids?
A. Yeah. I didn't mention anything on the report concerning the 37 year old, whether he received IV fluid. And I'd have to go to the main body of the text.
Q. Would you do that, then.
A. He received one liter of normal saline intravenously during resuscitation.
Q. And based upon the circumstances reported, then, that one liter of normal saline I.V. did not affect the fact that he was severely dehydrated at the time of autopsy?
A. Despite receiving one liter of normal saline, he was still severely dehydrated at the time of autopsy.
Q. Okay. And we'll return to that and talk about whether or not I.V. fluids affect dehydration at the time of death.
In addition to drawing on the medical literature, did you also draw upon the case that you have already referred to involving the death

that occurred in your state, New Mexico?
A. Yes.
Q. And is this where you wanted to correct me that it's not accurate to say sweat lodge?
A. Yes.
Q. Would you explain to the jury.
A. And this case involved an 11-year-old girl who was going through a Navajo, basically, coming-of-age ceremony. In this ceremony the young females are placed in what could be described as a superheated environment. They're placed in a small room where a fire is kept burning constantly. And there is no exact temperature given within the room itself but certainly described as being a very hot environment.

The difference between this case and what would be described as a sweat lodge death is that there is no water vapor involved. So water cannot be poured over the fire. So this is just dry fire heat.

But the circumstances in this case were that this 11-year-old girl was somewhat fluid and food restricted. She had access to food and fluids, but she was not taking in what we would consider a normal amount, so relatively restricted

fluids and food. And she was kept within this room, and the plan was for that to last over a four-day period.

On the third day of the ceremony, she began to be getting -- or she became -- started to become confused within the room itself. And one of her relatives took her temperature at that time, and her temperature was 103.3 degrees Fahrenheit. My assumption is that was an oral or axillary temperature, but that's not documented. I can't say for certain how that temperature was taken. At that time she was given more tea and -- but she was left in the room overnight that night.

The next morning she was, essentially, found dead. She was transported to the emergency room, and was dead upon arrival to the emergency room. She was transported to our office. And the autopsy demonstrated a healthy young girl who was severely dehydrated. Her sodium now -- this sodium was about 164 millimoles, which is very high. And the rest of the autopsy, apart from one finding in the heart that was unrelated to her death, was, essentially, normal.

And so once again it just shows you the degree that dehydration plays in the role -- or

what role it plays in these deaths.
Q. And in this case with the 11-year-old girl, I assume because it's a Navajo right of passage, she was Navajo?
A. Yes.
Q. Did this occur, then, on Navajo land?
A. It did occur on Navajo land.
Q. Okay. And was that in Taos, New Mexico?
A. Yes.
Q. You indicated that her temperature was 103.3. That was based upon what you read, and you've read the case file?
A. Yes.
Q. That was taken by a relative?
A. Yes.
Q. Shortly after she was pulled out on the third night?
A. It was taken on the third night. She wasn't pulled out until the following morning.
Q. All right. And did you see any evidence in the case file that you reviewed of whether or not this 11-year-old girl when EMS arrived -- I assume EMS was called?
A. Yes.
Q. That she received any IV fluids?

A. She did. She had access through her sternum. That's where her intravenous line was. And it certainly was attempted to give her fluids through that line. I don't know how much she received.
Q. The severe dehydration that was observed in that case -- was that, again, by vitreous testing?
A. Yes.
Q. So that's a clinical medical objective test?
A. Yes.
Q. Did the receipt of any fluids intravenously affect the fact that she was severely dehydrated at the time that she was autopsied?
A. No.
Q. Now, you drew upon those two cases to help you reach your opinions and conclusions in this case?
A. Yes.
Q. And were they supportive of your opinion or not supportive, you tell us, of the fact that severe dehydration is a component of heat stroke?
A. Yes.
Q. Now, I'd like to spend a little bit of

time with you helping the jury understand how it is that heat affects the body. The jury has heard a lot of testimony in this case that heat illnesses exist on a continuum or on a spectrum of this order. Would you agree with that?

A. Yes.

Q. Would you explain to the jury what that means.

A. I've talked about a little bit earlier on that heat-related illness does exist on a -- on a spectrum. The most mild form is heat exhaustion, and the most severe form would be termed "heat stroke."

And heat exhaustion doesn't necessarily have an association with an elevated temperature. Sometimes your temperature can be mildly elevated, and it's not associated with dehydration either. The typical symptoms for heat exhaustion are headache, nausea, maybe vomiting, and some people even pass out when they're experiencing heat exhaustion.

The reason they experience these symptoms is that what the body does physiologically to try and get rid of the heat that's accumulating inside the body is it starts pushing blood to the

periphery of the body; namely, out to the skin. So people who have heat exhaustion, who I'm sure everybody has seen before, have markedly red skin and that's because blood is being sent out to the skin so it can be in contact with the air and dissipate heat into the environment. That's really our first response.

What that does is it moves blood away from the brain. It moves blood away from the gastrointestinal tract and moves blood away from other organs. And that's why people typically will feel light-headed when they have heat exhaustion. That's why they might have GI upset or nausea and even experience vomiting.

And heat exhaustion is typically -- it's typically limited by just really -- fixed just by removing the person from that heated environment and giving them cool fluids.

Heat exhaustion, on the other end of the spectrum, is a severe, life-threatening process. It's defined by three main symptoms or presentations. One is an elevated temperature. Two is losing the ability to sweat. And three is a change in mentation, meaning not that they're passing out, but that they're becoming confused

disoriented, or even comatose and not responsive.

And as I said, for minor heat-related illness or heat exhaustion, all those symptoms are caused by, basically, diverting the blood from inside the body more to outside or into the skin so you can dissipate heat.

In heat stroke you're getting these symptoms now because you're severely dehydrated, your electrolytes are high, such as sodium, and it's sustained. If you keep a person in a high-heat environment for an extended period of time with their elevation of temperature, the heat itself can actually do damage to the cells of the body. It can damage your brain cells. It can damage your liver cells, lung cells, kidney cells. So that's how you start getting the other symptoms and signs that are related to heat stroke and not heat exhaustion.

MS. DO: Thank you.

Your Honor, may we take a break?

THE COURT: Yes. Thank you, Ms. Do.

Ladies and gentlemen, we will take the morning recess. Please reassemble in 15 minutes. That's 20 after. Remember the admonition.

And, Dr. Paul, the rule of exclusion of

witnesses has been invoked in this case.

Thank you.

(Recess.)

THE COURT: The record will show the presence of Mr. Ray, the attorneys, the jury.

Dr. Paul has returned to the witness stand.

Ms. Do.

MS. DO: Thank you, Your Honor.

Q. And, Dr. Paul, I'm going to ask you to raise your voice and speak into the microphone. Mr. Kelly was saying he couldn't hear you back there.

Before we took the recess, I had asked you to help explain to the jury how heat affects the body, and you were doing that. So let me try and get back to that.

Can you explain to the jury -- first, is there a difference -- clinically and physiologically, is there a difference between heat exhaustion on the one end of the spectrum and heat stroke on the other end of the spectrum?

A. Yes.

Q. And, first of all, do you agree that they are on opposite ends of the spectrum?

A. Yes.

Q. Will you explain to the jury, then, how they are different.

A. Well, heat exhaustion is on the mild end of the spectrum, and heat stroke is on the severe end of the spectrum. All the symptoms that are caused by heat exhaustion come from the fact that you're moving blood from inside the body to outside the body to the skin to facilitate cooling.

The difference between heat exhaustion and heat stroke is now you also have the blood moving to the skin or the outside of the body, but now you also have significant dehydration as a component of heat stroke. And you can also have direct heat injury to the cells of the body as well. So in heat stroke you may see damage to the brain, liver, kidneys, or other organs.

So the main difference between heat exhaustion and heat stroke, heat exhaustion is a mild form of heat-related illness, and the symptoms are really caused by blood moving to the skin to help cool the body off.

The symptoms -- signs and symptoms of heat stroke are really caused by three different processes that are going on. One is that blood

moving out to the skin. The second is severe dehydration. And the third is direct injury of the heat -- or direct injury of the cells of the body by the heat itself.

Q. And so as we -- first of all, this may be obvious to everyone in the courtroom. What is the normal body temperature for a person?

A. Well, it fluctuates per person, but somewhere around 98 degrees.

Q. Farenheit?

A. Farenheit.

Q. Okay. So as a body is exposed to heat, that increases that normal body temperature --

A. Uh-huh.

Q. -- are you then going to be in the mild end of the spectrum of heat exhaustion?

A. Can you repeat that question, please?

Q. Sure. As the body increases from the normal temperature of 98 -- it's 98.6?

A. Uh-huh.

Q. 98.6 degrees Fahrenheit, are you going to start experiencing the signs and symptoms of heat exhaustion?

A. No. And a mildly elevated temperature is also consistent with heat exhaustion.

Q. Okay. My question is, so as you move from your normal body temperature of 98.6 to anything elevated above that, are you going to start experiencing signs and symptoms of heat exhaustion?

A. Of heat exhaustion. I'm sorry.

Q. Okay.

A. Yes.

Q. All right. And so I just want to make sure that we've covered this, but I want to make sure that we understand it.

You're saying that blood is being moved to the skin; correct?

A. Yes.

Q. And where does that blood come from that's being moved to the skin?

A. So it's being taken from the blood that's typically going to all your body organs such as the brain, heart, lungs. Some of that blood is being diverted out to the skin.

Q. And why does the body do that in response to heat?

A. Because the skin is where heat is dissipated or released out into the environment. So the more blood flow you can send to the skin,

the faster you can release heat that's accumulating -- accumulated in the body.

Q. And so in response to heat, as the body moves blood away or diverts it away from the organs, what happens to the body?

A. Well, in some cases the blood flow can be a little bit inadequate to those organs. So, for instance, if you're diverting blood away from the brain, that's what would cause you to pass out.

Q. And that's called "syncope"?

A. Yes.

Q. Now, when you have blood diverted to the skin, what -- is that causing -- let me ask you this: What does blood carry?

A. So it carries many different things, but red cells are the primary component, which carries oxygen.

Q. And so as the body is moving the blood to the skin and diverting it from the organs, what happens then?

A. So you're also diverting some oxygen that would normally go to other organs to the skin itself.

Q. Okay. Does the body do anything else other than diverting blood to the skin to throw off

heat in response to heat?
A. Yes.
Q. And what is that?
A. It also -- the body also sweats.
Q. And what is the purpose of that?
A. So sweat building up on the skin surface evaporates, and that evaporative process dissipates heat pretty rapidly.
Q. What does sweat carry?
A. So water and salt.
Q. And so if your body is sweating to cool down in response to the heat, pathophysiologically what does that cause the body?
A. Eventually it can cause dehydration. You're losing mostly free water through sweat, and if you sweat enough over a period of time, you can become significantly dehydrated.
Q. So medically what causes heat exhaustion?
A. So one of the things that I've talked about with heat exhaustion is, basically, there is the body -- the body's heat is gradually building up because you're in a heated environment. And the body's response is to divert blood out to the periphery to release heat. Also the body will initiate the sweating process, which begins to cool

the body by the evaporative process.
Q. And then that's what results in dehydration?
A. Correct.
Q. Okay. Now, you've explained that the heat illness -- the heat exhaustion is on the mild end of the spectrum, and heat stroke is on the opposite end of the spectrum.
What is the demarcation? What divides the two disorders?
A. The principal clinical demarcation is an elevated temperature. The most common number given was 105 degrees Fahrenheit. And also mental status changes or changes in mentation -- confusion, coma, or other signs of neurologic dysfunction.
Q. Okay. And is that supported in the literature that you've looked at that the threshold temperature that divides heat exhaustion on the one end of the spectrum and heat stroke on the other end is 105 degrees Fahrenheit?
A. Yes.
Q. Have you also seen it at other numbers?
A. Yes.
Q. Okay. I think in this case the jury has heard from Dr. Mosley, whose opinion is that it's

107 degrees Fahrenheit.
A. That would be at the high end. Yes.
Q. Have you seen that?
A. I've seen 106. Not necessarily 107. No.
Q. All right. And Dr. Dickson and Dr. Cutshall testified to this jury and it's their belief that it's 104 degrees Fahrenheit. Have you seen that in the literature?
A. Yes.
Q. Okay. So the variability is at 104 to 106, in your opinion?
A. Yes.
Q. When we use words such as "continuum" or "spectrum," are we suggesting that there is sort of a progression -- a linear progression from heat illness to heat exhaustion -- heat exhaustion to heat stroke?
A. Yes.
Q. Could you explain to the jury what that means.
A. It means that you would experience worsening signs and symptoms of heat exhaustion as it became more and more severe and you started slipping into the heat stroke range. So over the -- or during the progression of heat

exhaustion, if you're not removed from that heated environment is that your nausea and vomiting would become worse. You develop a worsening headache. And at the end of heat exhaustion you might even start passing out or developing syncope. So the patients would become more and more symptomatic as they remain in that superheated environment.
Q. The jury has heard some testimony regarding altered mental status and the word "syncope." If a person is suffering from heat exhaustion and they faint, which is medically syncope, does that altered mental status mean that they are at that point suffering heat stroke?
A. No.
Q. Okay. And have you seen that in the literature?
A. Yes.
Q. Let me approach you with an article that Dr. Dickson had provided me. It's from eMedicine. It's called "Heatstroke" from Dr. Helman, et al.
Have you, first of all, heard of eMedicine?
A. Yes.
Q. As a doctor have you consulted with eMedicine?

A. Yes.
Q. And is that a fine source to rely on and consult with as a doctor?
A. Yes.
Q. Would you rely on it exclusively?
A. Not necessarily. No.
Q. Okay. Would you in relying on eMedicine or any other article, essentially, cut and paste from the text?
A. In what context?
Q. For your report.
A. No.
Q. Okay. And if you relied on an article, would you cite to it?
A. Generally if I -- if the information is unique to that article and if I take something roughly verbatim from that article, I do. But if I'm reviewing general information and using that in my report or other publications, not necessarily. No.
Q. Okay. But if you took it verbatim, you would cite?
A. Yes.
Q. And if you took it verbatim from any article, whether it's eMedicine or another, would

you change any of the text without attributing the change?
A. It depends on what -- it depends on how it affects my report and what text I'm changing. If you're talking about grammatical changes, I don't think that's -- it's important. If you're talking about objective facts, I think that probably is important.
Q. Okay. Looking at this eMedicine article, have you seen this before?
A. Yes.
Q. And in this eMedicine article, I'm going to read a line here -- or a paragraph, rather. Heat illness may be viewed as a continuum of illnesses relating to the body's inability to cope with heat. It includes minor illnesses such as heat edema; heat rash; that is, prickly heat, heat cramps and tetany as well as heat syncope and heat exhaustion.
Do you agree with that, first of all?
A. Yes.
Q. Okay. Could you tell the jury what heat edema is.
A. Actually, I'm not sure how it's defined in this article. And the other findings that they

describe are very common. So I'm not sure what they're referring to as "heat edema" --
Q. Have you heard of that phrase before?
A. No.
Q. Okay. And there is heat rash, prickly heat?
A. Yes.
Q. Have you seen that before?
A. Yes.
Q. Heat cramps and then tetany, t-e-t-a-n-y. What is that, if you know?
A. It's a sustained cramp. Basically, it's a sustained muscle contraction.
Q. Okay. And as the article describes, is this the continuum going from less severe to more severe?
A. Yes.
Q. Okay. So we've got heat edema up to heat cramps and tetany, which is a sustained cramping?
A. Yes.
Q. The next thing it has is heat syncope, s-y-n-c-o-p-e. Have you seen that?
A. Yes.
Q. And syncope you've explained to the jury as what?

A. Passing out.
Q. Fainting?
A. Fainting.
Q. And then you've got heat exhaustion.
A. Yes.
Q. Okay. So even in this eMedicine article provided to me by Dr. Dickson, it appears that the doctors in this article classify syncope or fainting or passing out as a disorder before heat exhaustion?
A. Yes.
Q. Have you seen that before?
A. Yes.
Q. Okay. And then in the next line -- so, again, if a person faints from heat exhaustion, you've explained that that is the result of the blood being diverted and oxygen has been carried away from the brain?
A. Yes.
Q. Okay. And so if a person faints under those conditions, that doesn't mean that that's altered mental status establishing or proving heat stroke?
MR. HUGHES: Object to the leading questions, Your Honor.

THE COURT: Sustained.
Q. BY MS. DO: My question to you, Doctor, is, heat syncope, which is fainting -- does fainting mean that that is heat stroke?
A. No.
Q. Okay. And that's consistent with this eMedicine article provided by Dr. Dickson?
A. Yes.
Q. The next line. Let me read it to you. Heat stroke is the most severe form of the heat-related illnesses and is defined as a body temperature higher than 41.1 degrees Celsius or 106 degrees Fahrenheit associated with neurologic dysfunction.
Do you agree with that?
A. Yes.
Q. Okay. And so if you were, for example, citing that paragraph, would you change the temperature of 106 degrees Fahrenheit to 104 without indicating that you're doing that?
MR. HUGHES: Objection. Misstates. The paragraph wasn't cited in Dr. Dickson's report.
MS. DO: I think it was a hypothetical.
THE COURT: It could be taken as a hypothetical question.

And you may answer that if you can, Dr. Paul.
THE WITNESS: I think the best way for me to answer that is that generally I don't rely on one particular article, that generally I will try to find a series of the best articles I could find on a certain subject. And if I were using this particular sentence, I would probably be more likely to put in the range of temperatures that I've discovered in the literature.
So that would probably be the best way I can answer that question. So I wouldn't eliminate that number, but I may augment it with other readings that I have done.
Q. BY MS. DO: Okay. And would you indicate that you're doing that?
A. Yes.
Q. Okay. Now, when it says in this article, heat stroke is the most severe and is defined as a body temperature higher than 106, it is your opinion that the threshold is 105?
A. Yes.
Q. Okay. What happens then? If you could explain it one more time, what happens to the body when the temperature shoots from 98.6 degrees

Fahrenheit to 105 degrees Fahrenheit?
A. And that's the hallmark of that -- of that switch to the higher temperature. It is manifested or presents with significant mental status change or changes in mentation.
Q. Okay. And we'll talk about the various ways that that occurs.
In heat exhaustion, what typically -- what kind of activities do you typically see that in?
A. Are we talking about nonexertional heat exhaustion?
Q. Then why don't we explain that to the jury. Is there a difference?
A. There is. And there are two types of heat exhaustion or heat-related illnesses. One is exertional, meaning that it's happening during active exercise or activity. And the other is nonexertional, where you're just placed into a hot environment and you're not necessarily exercising or pursuing any type of vigorous activity.
Q. Okay. So if it's exertional heat exhaustion, you would typically see that in sport activity, for example?
A. Sport activities or any activity where

you're exerting yourself in a hot, humid environment.
Q. Okay. And nonexertional doesn't have the activity component that you're exposed to heat?
A. That's correct.
Q. Okay. If you were suffering from heat exhaustion on the milder end of the heat illness spectrum, what kind of intervention would allow you to recover?
A. Really just two things: One is to be taken out of that hot environment. It's probably the most important. And then, two, just giving them something cool to drink replacing some of the fluid that they lost.
Q. Could that include something like Gatorade or Powerade?
A. Yes.
Q. Now, if you did those two things -- removed somebody who's suffering from heat exhaustion on the milder end of the spectrum and gave them something like Gatorade or fluids -- what's the recovery rate?
A. It would be expected that every person suffering from heat exhaustion would recover.
Q. So 100 percent?

A. Yes.
Q. Are there any long-term effects?
A. No.
Q. Okay. With heat stroke you said it's when the body moves to 105 degrees Fahrenheit. Let's talk, then, about the pathophysiology when you reach that core temperature.
You talked about the mental status change. Could you explain to the jury what happens in mental status change when the body reaches 105 degrees?
A. So as you reach that temperature and you move into heat stroke, the body now is severely dehydrated, and that's one thing that could be causing those mental status changes. But with that body temperature and remaining in that heated environment, you can start damaging the cells of the body -- brain, liver, heart, et cetera.
Q. Can you explain to the jury a little bit more how severe dehydration results in brain injury.
A. Yes. So as the concentration of electrolytes goes up, such as sodium, what happens is you start drawing water out of the cells of the brain, out of the neurons, and towards that sodium

concentration which is in the blood. That can directly damage the brain cells, which results in brain swelling and changes in mentation.
Q. What is that brain swelling called?
A. Cerebral edema.
Q. Okay. So if -- and so, as I understand it, there are two ways the brain can be injured in the case of heat stroke. One is through severe dehydration?
A. Yes.
Q. The other one is direct injury by heat?
A. Yes.
Q. In the case of severe dehydration, is that brain injury reversible?
A. It can be. Yes.
Q. Could you explain to the jury how.
A. And with gradual rehydration or normalization of the electrolytes in the body, then you could reverse those changes if they're early.
Q. If it's severe dehydration?
A. Yes.
Q. Now, if it's the other kind of brain injury where it's direct injury from the heat, is that reversible?
A. No.

Q. Let me now, then, move you, Dr. Paul, into your review of the medical records and applying what you just explained to us in heat illnesses. To summarize, then, what are the components, the clinical medical evidence, that you're going to be looking at to determine whether or not there is heat stroke?
A. I think the first thing that you have to look at in the clinical record are is there any evidence of those three diagnostic criteria for heat stroke? Is there a documented elevated temperature in any of the critically ill patients?
The second thing, is there any evidence that there is significant dehydration in any of the critically ill patients?
And the third is a little bit tougher to assess because it's not commonly documented in the medical records. But that's losing the ability to sweat. That's also the hallmark of heat stroke.
So when I went through the medical records, the -- really the most important things that I was looking at are: A, the temperature of the critically ill patients and when those temperatures were taken, also whether there was any evidence at all of dehydration.

Q. Okay. And when you reviewed the medical records of these 18 patients, looking back at the chart that you have as Exhibit 1083, first of all, Doctor, did you note the time of their examination by any EMS personnel in the field?
A. Yes.
Q. And is that included in column No. 4 under "EMS Exam"?
A. So the time the temperature was taken?
Q. No. No. No. I want to explain the summary to the jury. When you reviewed the patient records, did you note the time that the patient was seen by anyone -- EMS personnel in the field, meaning at the sweat lodge?
A. Yes.
Q. And is that the time that is reflected in this column, "EMS Exam"?
A. Yes.
Q. Okay. Did you also note for each of the 18 patients the time that EMS then transported the patient from Angel Valley to whatever hospital received them?
A. Yes.
Q. And that's under the column that's stated "Transported"?

A. Yes.
Q. Did you also note in reviewing 18 patients' records the time that they were admitted, meaning the time they arrived to the emergency room at whatever hospital received them?
A. Yes.
Q. And is that in the column under "Admitted"?
A. Yes.
Q. Did you also note for each of the 18 patients the time for the decedents that they were pronounced deceased?
A. Yes.
Q. And for those who were critically ill or discharged, the time that they were -- the date and time that they were discharged?
A. Yes.
Q. And is that under the column marked "Deceased and Discharged"?
A. Yes.
Q. Then did you also in reviewing the patient records note the temperature that was taken -- or temperatures and the time that those temperatures were taken at?
A. Yes.

Q. And that's reflected also in the summary?
A. Yes.
Q. In reviewing the medical records, did you also look for evidence of dehydration in the 18 patients?
A. Yes.
Q. Is that reflected in the column that states "Dehydration"?
A. Yes.
Q. And we'll talk about this a little further.
Did you in reviewing 18 patients' records also look to see what evidence were of their pupil size?
A. Yes.
Q. And that's reflected under a column called "Pinpoint"?
A. Yes.
Q. The second-to-last column is labeled "Attending." Did you note the attending doctor?
A. Yes.
Q. Okay. And then, finally, the last column indicates the exhibits that you referred to in order to derive these various data points?
A. Yes.

Q. In reviewing these 18 patients, their medical records, did you note any kind of pattern in terms of the time these patients were taken from the scene to the hospital?
A. Yes.
Q. Could you explain to the jury.
A. So the time that they were transported were all roughly similar to the critically ill patients just because they were critically ill. So these were the first patients generally that were transported to the hospital.
Q. Looking at, for example, patients No. 1 through No. 10, Brown to Bivins, I see times that are in between roughly 5:40 to 6:40 p.m. Was that what you saw?
A. Yes.
Q. And then there seems to be a second group starting with Ms. Andretti, patient No. 11, to patient 18, Ms. Veguilla, where the time in the field is roughly 9:00 p.m. and the time of transportation from the scene is as late as 10:30 p.m.?
A. Yes.
Q. Okay. So is it fair to say that looking at the patients' records, there appear to sort of

be two groups of patients transported from the scene?
A. Yes.
Q. Okay. Let's talk about group No. 2, the later group. Did you find anything remarkable in their medical records?
A. The only thing remarkable is that some of the patients demonstrated very mild dehydration, and that's documented in this chart. Those patients would have been Ronan, Bivins, and Andretti.
The temperatures are probably unreliable because you can see the times at which they were taken. A long time span had elapsed since the event and the time that their temperature was taken in the hospital.
The other thing is that the pupil sizes were all normal in this second group.
Q. And when you say "normal," are you referring to what's been written down as "PERL"?
A. Yes.
Q. And what does that stand for?
A. Pupils equal and reactive to light.
Q. And that means normal size?
A. Yes.

Q. Okay. Now, when you said to the jury that the temperatures for this second group of patients, is that starting with Mr. Ronan, patient No. 9?

A. Yes.

Q. And going down, what do you mean when you say it's unreliable?

A. Unreliable in the sense that a lot of time has passed since the event occurred. And so you can look at the time that the temperatures were taken. Actually, Mr. Ronan's was taken the earliest at 6:26. But some people had their temperature taken at almost midnight of that -- of the day of the event on the 8th of October.

Q. Okay. And on this chart we have several different "Ts." And "T" stands for temperature?

A. Yes.

Q. Okay. So the jury understands, when they look at this on their own, at the bottom there is a legend. If the "T" has a subscript with a "T" next to it, does that mean it's a tympanic temperature?

A. Yes.

Q. And a tympanic temperature is what?

A. In the ear.

Q. Okay. If there is an "RE" next to the

"T," is that a rectal temperature?

A. Yes.

Q. And if there is an "AX" next to the "T," is that axillary?

A. Yes.

Q. And what is axillary?

A. The armpit or under the arm.

Q. Okay. And there is also a fourth -- a "T" with a subscript of "UK." Does that mean it's unknown?

A. Yes.

Q. Okay. Just so the jury understands how much time has elapsed, I'm going to show you Exhibit 134 that's in evidence indicating that the first 9-1-1 call came out at 5:19 p.m. So using that time, has about five hours roughly passed from the incident to the time that the second group of patients is transported?

A. Yes.

Q. Okay. So did you rely at all on the temperatures of that second group of patients to reach your opinion and conclusion in this case?

A. No.

Q. All right. Let me go now, then, to the six that are shaded or highlighted in the chart,

the three decedents and the three critically ill.

Did you see any pattern of a core temperature with respect to those patients?

A. The temperatures that were taken in those patients were all well below the threshold cutoff for -- for heat stroke. There is the confounding factor, though, that time has passed as well from the first EMS call to the time that these temperatures were taken.

Q. So with Mr. Shore and Ms. Brown, no temperature was recorded?

A. Yes.

Q. And for Ms. Neuman what were the temperatures that were recorded?

A. She had two temperatures taken. The first one at 6:25 was 97.5 degrees Fahrenheit; and the second, which was taken at 6:46, was 101.66.

Q. Okay. And the first temperature for Ms. Neuman is an axillary temperature?

A. Yes.

Q. Okay. And we have here all the temperatures in Fahrenheit. And the jury's heard evidence of this in Celsius. Can you tell the jury how to convert Celsius to Fahrenheit?

A. Yes. So you, basically, multiply the

Celsius times 1.8 and then add 32.

Q. Okay. So let's talk about Ms. Neuman. She had an axillary armpit temperature taken at 6:25 p.m. of 97.5 degrees Fahrenheit. Do you know whether or not an axillary temperature is more or less reliable than a rectal temperature?

A. Less reliable.

Q. Okay. Do you know how many degrees of difference an axillary temperature is to a rectal temperature?

A. It probably underestimates it by at least a degree. At the most, it underestimates it by a couple of degrees Fahrenheit. So it is possible that her temperature was two degrees higher, 97.5 when that -- or 99.5 when that was taken.

Q. Okay. So in your training and experience, axillary temperature might be one to two degrees -- if I understood you correctly, one to two degrees less than a rectal temperature?

A. Yes.

Q. Okay. If Dr. Cutshall, the ICU doctor who treated Ms. Neuman, also hypothetically testified in this case that an axillary temperature is not as accurate as a rectal but usually a few degrees off from a rectal temperature on the date

of March 29, would you agree or disagree with that?
A. I would agree.
Q. Okay. So if Ms. Neuman was 97.5 degrees Fahrenheit axillary at 6:25, then what is your best estimate of her core temperature at that time?
A. The -- at 6:25, my best estimate is that her temperature was no higher than 99.5 degrees Fahrenheit.
Q. And where does that put her in terms of heat illnesses?
A. If this were heat illness related, it would put her in the heat exhaustion category.
Q. Not heat stroke?
A. Yes.
Q. Okay. Now, she then had a rectal temperature taken. Was that in the emergency room?
A. Actually, I don't know exactly where that temperature was taken.
Q. Okay. Do you want to review her record?
Your Honor, it's noon. Would you like to take a lunch break?
THE COURT: We can do that. We will do that.
And, ladies and gentlemen, please remember the admonition and be reassembled at 1:15 -- 1:15 today, and we will start at that time.

Thank you. We are in recess.
(Recess.)
THE COURT: The record will show the presence of Mr. Ray, the attorneys, the jury.
And Dr. Paul has returned to the stand.
Ms. Do.
MS. DO: Thank you, Your Honor.
Q. Good afternoon, Doctor.
A. Good afternoon.
Q. Before we took the lunch break, we were talking about Ms. Neuman and her recorded temperatures as you saw them in the medical records. I've cleared the witness stand of everything except for Ms. Neuman's medical records. Would you please take a look at Exhibit 369, which I placed in front of you.
Do you have that?
A. Yes.
Q. And is Exhibit 369 the Guardian Air records for Ms. Neuman?
A. Yes.
Q. Okay. And looking at 369, can you tell me if that record has her temperature -- the axillary temperature of 97.5 degrees Farenheit recorded?

A. Yes.
Q. And let me put that up for the jurors. Which page is that on, Doctor?
A. 95 -- 2595.
Q. Okay. Do I have that up there at 97.5 degrees Farenheit?
A. Yes.
Q. And your record shows that temperature recorded at 6:25 p.m.?
A. Yes.
Q. And as you indicated earlier, 1825, that's 6:25; right?
A. Yes.
Q. You had indicated earlier that based upon the degree of differences between the axillary, the armpit temperature and a rectal temperature that you believe the maximum to be about 99.5?
A. Yes.
Q. Now, looking at her medical records from Flagstaff Medical, which I put in front of you, Exhibit 365, could you tell me whether or not you had seen a rectal temperature recorded for Ms. Neuman?
A. Yes.
Q. And is that -- what page is that on?

A. 600 -- 2600.
Q. And so let me highlight that for the jurors. It's at the top of the record?
A. Yes.
Q. We see doctor's exam time of 1846. Is that 6:46 in civilian time?
A. Yes.
Q. And then to the right there is a handwritten note of 38.7 R.
A. Yes.
Q. Is that 38.7 Celsius for rectal?
A. Yes.
Q. And then converting that would give you what?
A. 101.66 degrees Farenheit.
Q. In terms of this temperature when she's pulled out -- and we're going to assume 5:19 p.m. because that's the first 9-1-1 call -- to the time that an axillary temperature was taken of 97.5, is that about an hour that's transpired?
A. Yes.
Q. Okay. Is that consistent, in your medical opinion, with Ms. Neuman having heat stroke?
A. The temperature is not consistent. No.

125

Q. With the rectal temperature -- now we're looking at it -- it's 101.6. So going from 99.5 degrees Farenheit to 101.66, her temperature is actually climbing?

A. Yes.

Q. Is that consistent or inconsistent with heat stroke?

A. It's inconsistent with heat stroke, and the reason is is that we have a baseline temperature before the rectal temperature was taken. So we have a baseline temperature of 97.5 degrees Farenheit taken at 6:25 p.m. The patient is now in a cool, controlled environment and, if anything, should be dissipating heat at this point, and her temperature should be going down.

But the converse is happening. Her temperature is taken a few minutes later at 6:46 p.m. and is now at 101.66. So there has to be another reason for her temperature to -- to -- for her temperature to continue elevating like that.

Q. Okay. So if it was a case of heat stroke, in your opinion, it hasn't met the threshold?

A. That's correct.

126

Q. And if it's a case of heat stroke, because she's been removed from the environment, you would assume that her temperature should be going down?

A. Especially at this -- at this hour. Yes.

Q. Okay. But what you see is the opposite?

A. Yes.

Q. Is there any medical explanation for that?

A. There is. And in critically ill patients for a variety of reasons can experience something called "SIRS," or systemic inflammatory response syndrome. And it's, basically, a -- your own body's response to a critical illness. And your body perceives a threat of -- because of this illness, and it initiates its own inflammatory or immune reaction in your body. And it can cause mildly elevated temperatures such as we see here.

Q. Is there anything in Ms. Neuman's medical records that indicate to you from a medical, clinical standpoint that Ms. Neuman may have been experiencing SIRS --

A. Yes.

Q. -- S-I-R-S?

A. Yes.

127

Q. And what is that, Doctor?

A. The diagnostic criteria for SIRS -- there are four. One is elevated heart rate. One is elevated breathing. One is elevated temperature. And the other is elevated white count, or the white blood cells or the inflammatory cells are present in your body.

Q. And you saw evidence of all that in Ms. Neuman's records?

A. Yes.

Q. Okay. Now, assuming hypothetically that Ms. Neuman was taken out of the sweat lodge ceremony and a witness testified to this jury that she was in charge of the hose that was at the scene to wet down people, that she testified that she did not hose down Ms. Neuman because the hose had not reached her and that what she did was took two cups the size of which are on this witness stand -- and Ms. Rybar indicates to me this is 14 ounces -- two 14-ounce cups of water and splashed onto her chest, is that considered aggressive cooling or passive cooling?

A. It really would be considered more passive cooling.

But I'd like to explain what active and

128

passive cooling are, if I may.

Q. Could you do that.

A. And in -- there are two methods of cooling patients that are experiencing heat-related illness. Passive cooling would be just placing them in a nonheated environment at a normal air temperature, say, 70 degrees, and their body will dissipate heat over time and return to a normal temperature.

The other way to decrease body temperature is by -- or actively reduce body temperature is by placing them in a very cold environment. One method would be to place them in an ice water bath that's approximately 2 to 4 degrees centigrade. And when the body is placed in an ice water bath, it would rapidly dissipate heat out into the ice water.

The other way to actively cool a body is by placing fluid on top of the body and placing an air source near the body. So you would blow a large fan of air over the body, continuously putting water onto the body and accelerating the evaporative cooling effect. That would be the other way to -- or one other way to actively cool.

So by pouring a small amount of water on

129

the body, it certainly would help, but the effect would not last long, and it would probably reduce the body temperature by a very, very small amount.

Q. So let me go back to the first method that you spoke about, basically, immersing somebody into an ice bath. Have you seen that in any emergency rooms?

A. Yes. For febrile temperatures. Yes.

Q. What does that mean?

A. So you can reduce body -- you can reduce the body temperature for many reasons in an ice water bath. Children with viral illness sometimes have very high temperatures that are dangerous, and they can be actively cooled in an ice water bath.

Q. Other than your experience, have you also seen in the medical literature that ice water emersion is considered one of the aggressive cooling methods for heat stroke patients?

A. Yes.

Q. Now, the jury has heard from Dr. Cutshall, who is the ICU doctor from Flagstaff Medical Center. And assuming hypothetically that he testified to this jury when asked if he's ever come across literature in his medical experience that aggressive cooling measures, induding

130

immersing someone in an ice bath, Dr. Cutshall testified cooling is often -- we do have ice baths where we do that that is actually -- there is actually literally a bathtub set up in the emergency room at Flagstaff Medical Center.

Is that consistent with what you've seen?

A. Yes.

Q. And, again, assuming hypothetically that the ICU doctor, Dr. Cutshall, testified to this jury that one of the first things an ER doctor is going to do with a heat stroke patient is aggressively cool them, do you agree or disagree with that?

A. I agree with that.

Q. Okay. Now, the ice water bath you indicated would have to be at what temperature?

A. So it's close -- it's close, but not at the freezing point of Celsius. So 2 to 4 degrees Celsius would be a good estimation.

Q. Okay. And the other cooling method you mentioned was -- and I can't remember what your words were -- putting water and then a large source of -- what was it that you said?

A. So putting the -- an air fan source near the body so you're blowing air over the body and

131

placing water on it at the same time so you accelerate the evaporative process.

Q. Okay. Have you ever heard of a cooling measure called a "lavage"?

A. Yes.

Q. Have you seen that in the ER?

A. I've not seen it done to cool a patient. But I've certainly read about it and know of it.

Q. Could you tell the jury how that works.

A. A tube is placed in the stomach and a tube can also be placed in the bladder, and cold water is irrigated through both tubes. And that way it helps cool the more central portion of the body.

Q. Is that considered more invasive than the ice bath or the fan method?

A. Yes.

Q. When you reviewed the patients' records, did you see any evidence that either EMS or the ER doctors used any aggressive cooling measures to treat heat stroke or hyperthermia?

A. No.

Q. I'd like you to take a look at Exhibit 366, Ms. Neuman's medical records, one of the volumes. And we're going to take a look at

132

page -- Bates stamp 3014. And I'm going to point you -- this is the critical care evaluation report by Dr. Cutshall.

Are you on the same page?

A. Yes.

Q. Okay. Is that correct, Doctor?

A. Yes.

Q. Now, looking at the critical care evaluation by Dr. Cutshall, I know in the description of treatment Ms. Neuman received what was called a "charcoal lavage."

A. Yes.

Q. And you just explained to the jury the lavage that's used to cool down a heat stroke or hyperthermia patient. Is that what Ms. Neuman received?

A. No.

Q. What is a charcoal lavage?

A. A charcoal lavage is -- you would also place a tube into the stomach, but you would introduce, basically, charcoal or a charcoal-like component into the stomach. That is typically done for poisoned patients, patients who have ingested too much of a medication or toxin. And some of these medications can be absorbed by the charcoal

133

and eliminated, basically, from the body. So it's a method to detoxify a patient, not cool them.

Q. Okay. So the treatment Ms. Neuman received in the ER at Flagstaff Medical Center was for a poison -- a possible poison?

A. Yes.

Q. Not hyperthermia or heat stroke?

A. Correct.

Q. Let me move to Tess Wong, patient No. 6. You included her in the group of critically ill patients?

A. Yes.

Q. And looking at her medical records, which is Exhibit 396, Doctor, did you note her temperature?

A. Yes.

Q. And what was it?

A. At 8:00 p.m. -- or 8:05 p.m. it was 95.18 degrees Fahrenheit.

Q. Is that considered below normal?

A. Yes.

Q. Is that hyperthermic or hypothermic?

A. Hypothermic.

Q. Which means?

A. Abnormally low.

134

Q. Okay. Now, it is 8:05, so it's a few hours after the sweat lodge incident; is that right?

A. Yes.

Q. Okay. Now, I want you to assume hypothetically that the jury has heard from a witness named Dawn Gordon, who testified that when Tess Wong came out of the sweat lodge, she was observed to have pinpoint pupils, described as being very small, like a dot, and within minutes was shivering.

If Ms. Wong came out of the sweat lodge ceremony at the threshold of 105 degrees Fahrenheit, would she be able to under any circumstance go from 105 to shivering within minutes?

A. No.

Q. Would you explain to the jury.

A. In the experimental data that has looked at cooling techniques and the rate of cooling, the maximum rate of cooling is probably about .1 maybe .2 degrees Celsius per minute. So at best -- at best, it would take several minutes of actively cooling somebody in an ice water bath to bring them back down closer to a normal temperature.

135

Simply removing somebody from a heated environment who is at the threshold temperature for heat stroke, about 105 degrees, and placing them in a normal temperature environment, it would take many minutes for them to cool down to a normal body temperature.

Q. Okay. So when you say "aggressive," are you talking about the ice bath emersion or the use of the fan?

A. Really the most aggressive would be the ice water bath. But both would be considered active cooling.

Q. Did you see any evidence in Ms. Wong's medical records to indicate to you that there is a set of circumstances that would explain how someone if they were at 105 coming out of the sweat lodge would be reduced to the point where they would be shivering within minutes?

A. No.

Q. Okay. So we've now discussed the clinical evidence you saw in the medical records showing no evidence of the threshold core temperature; is that right?

A. Yes.

Q. Let me now move to the second component

136

that you discuss in which you reached the opinion that it was not supportive of heat stroke. And that's severe dehydration. Did you see any pattern of severe dehydration in any of the patients?

A. No.

Q. What did you see?

A. At most, I found two patients to be mildly dehydrated. That was Stephen Ray and also Sidney Spencer. I think of note, the two patients who died at the scene -- or during transport from the scene, at the time of their autopsy, there was no evidence of dehydration. They had an absolute normal BUN and an absolute normal creatinine.

Q. Would you explain to the jury what kind of clinical or medical evidence you would look at for markers of dehydration.

A. Some of the best markers to look at for dehydration would be a BUN or blood urea nitrogen. And typically that's elevated in somebody who is dehydrated. You can also look at creatinine, and that's also typically elevated in dehydration.

The other things you can look at for dehydration are the concentrations of the electrolytes in the blood, particularly sodium. So the sodium would be elevated as well in somebody

who is significantly dehydrated. And you can also look at the concentration of the urine to see if the urine is very concentrated, which you would expect in somebody who is severely dehydrated.

Q. In looking at all those objective clinical or medical markers -- the BUN, the creatinine, the urine -- did you see any evidence to indicate that Kirby Brown or James Shore were even mildly dehydrated?

A. No.

Q. With respect to Ms. Neuman, what did you find?

A. Clinically there was no evidence of dehydration.

Q. Also using all the markers that you've just described?

A. Yes.

Q. Let me go back for a moment to Kirby Brown and James Shore. You've already explained to this jury that they were not dehydrated per a vitreous fluid test.

A. That's correct.

Q. And that's considered the gold standard.

If the evidence in this case is that Ms. Shore -- I'm sorry, Ms. Brown and Mr. Shore

were taken out of the sweat lodge ceremony and observed by a medical doctor who participated to be asystolic at the scene and continued to be asystolic until she arrived at the ER where she was -- where they were both pronounced deceased on arrival, any amount of I.V. fluid or hydration would change the vitreous fluid that is seen at the time of autopsy?

A. No.

Q. Would you explain that to the jury.

A. The vitreous fluid in the eye is a little bit different from blood. It closely reflects the state of your electrolytes as well as creatinine and BUN at the time of death. But it takes -- it takes a few minutes for it to equilibrate. Simply giving somebody who is already deceased and receiving CPR intravenous fluids would have very little, if any, effect on those markers in the eye fluid.

Q. And what you just explained to the jury, was that supported by the two cases we discussed earlier where the 37-year-old man in the Australian sweat lodge was given I.V. and was severely dehydrated by vitreous testing and the same with the 11 year old?

A. That's correct. So both of those cases that I discussed, they both received intravenous fluid as well as CPR, and it had little or no effect on their vitreous testing. They were still severely dehydrated.

Q. Would you agree or disagree with my statement that it would be misleading to suggest to this jury that you could rehydrate either Kirby Brown or James Shore in this case given the circumstances?

A. I think that would be misleading.

Q. Now, with respect to Ms. Neuman, you indicated you looked at all the objective medical markers and found that she was not dehydrated?

A. That's correct.

Q. Not even mildly dehydrated?

A. That's correct.

Q. Looking at her medical records, is there any circumstance that would explain her lack of dehydration at the time of testing? And let me ask you, obviously Ms. Neuman was in the hospital for some time before she passed?

A. Yes.

Q. And were labs or chemistries done upon her arrival on October 8, 2009, to determine

whether she was dehydrated or not?

A. Yes.

Q. Can you tell me where in the record that's at.

A. It's page 2841.

Q. Would that be Exhibit 365? They're broken into four volumes. The Bates stamp number -- would you be able to find it in the volume that's designated Exhibit 365?

A. Yes.

Q. Okay. And what page of -- 2841 you said?

A. Yes.

Q. Okay. I -- hold on. Can you point to where I would be looking.

A. Is that -- is that 2841?

Q. Okay.

A. That's 2841. Well, in the top grid, if you look at the bottom right-hand corner.

Q. On your screen, Doctor, you can touch it, and I'll know where you're looking.

A. All right.

Q. Okay.

A. Yeah. Right there.

Q. Let me just pull that whole section up.

And you want to focus in on which value,

which figure?
A. Yeah. So the last column is BUN.
Q. Let me first show the jury the time that we're referring to. Sorry. We're looking at some chemistry or labs that were run on October 8, 2009, at 1900 hours?
A. Yes.
Q. That would be 7:00 p.m.?
A. Yes.
Q. And you wanted me to show the jury the last figure?
A. Yes.
Q. And what is that?
A. That's the BUN, which is 15, and that's a normal value.
Q. Okay. And BUN we would know because at the top it indicates there what the normal range would be, 7 to 17?
A. Yes.
Q. All right. And so at 7:00 p.m. when she's admitted on October 8, they ran tests that showed that she was not dehydrated at that hour?
A. That's correct. Yes. So all of her markers were negative for dehydration.
Q. Okay. So we're talking about less than

two hours after she's taken out of the sweat lodge ceremony using the first 9-1-1 call at 5:19 p.m.?
A. Yes.
Q. Okay. Is there -- reviewing her records, was there anything in there that would explain the absence of dehydration for Ms. Neuman?
Let me ask a better question.
A. Yes. I'm not sure I understand.
Q. Did you see any -- we talked earlier about how I.V. fluids could affect the level of hydration or dehydration. Do you recall that?
A. Yes.
Q. Did you see anything in Ms. Neuman's medical records, either the EMS or the ER records, to indicate that she received enough I.V. fluids to make her not dehydrated at 7:00 p.m. on October 8?
A. No.
Q. Would you explain to the jury, if you can.
A. And I'd have to go back for specific numbers for intravenous fluid. I don't know those off the top of my head.
Q. Please do that.
A. So during transport by the paramedics --
Q. Can you tell me what I should show the

jury so we can follow.
A. It's page 2594.
Q. And that would be Exhibit 365?
Doctor, do I have the right page up on the screen?
A. 365 is the exhibit.
Q. Okay. Is that the right page?
A. And that's the right page. Yes.
Q. And what should we show the jury?
A. Well, if we look at this section right here.
Q. Okay.
A. And it talks about the intravenous fluid that the patient received and the rate at which it was given. If you look underneath rate, it says 500 cc per hour. So that's the amount of fluid that would enter the body over a one-hour period.
With somebody that's significantly or severely dehydrated, it would probably take three to four liters to make a significant clinical response. So this is a very small amount of fluid that the patient is receiving and would not affect the markers of dehydration.
Q. So 3 to 4 liters, and she received here 500 cc per hour?

A. Well, we don't even know if she received that entire amount. Well, yes. She's -- her rate is 500 cc per hour. But I don't know what the total concentration -- or total amount was that she received.
Q. Okay. So I don't know a cc to liter. Can you translate for the jury so we understand.
A. I'm sorry.
Q. That's okay.
A. A cc is a milliliter. 500 milliliters would be one-half liter.
Q. And you're saying 3 to 4 liters would be required to make a clinical difference?
A. Yes.
Q. And how much time would pass?
A. Before -- before you saw a clinical difference?
Q. Yes.
A. With that rate of rehydration, at least a couple of hours.
Q. Is there any other medical or clinical evidence that would indicate to you that if somebody received enough IV fluid to affect their hydration level that you would see it in the medical records?

A. In this -- in this patient or in all the patients?

Q. In any patient generally.

A. I didn't see any documentation that any of these patients received enough intravenous fluid to change their hydration status.

Q. Okay. So now you've explained to the jury why it was that you saw no clinical evidence of heat stroke, there was no evidence of a core temperature, and no evidence of severe dehydration?

A. That's correct.

Q. All right. Now, you said that you saw some clinical or medical data that was inconsistent, not just unsupported, but inconsistent with heat stroke?

A. Yes.

Q. And we are going to start where you had started, which is respiratory failure.

Before we do that, you also told the jury this morning that you believe that those signs and symptoms -- the respiratory failure, pulmonary edema, comatose, the high blood pressure, the pinpoint pupils -- were consistent with a toxicity of organophosphates?

A. Yes.

Q. So maybe it would help if you could explain to the jury now how it is that organophosphates affect the human body.

A. Yes. In the -- organophosphate toxicity or pesticides toxicity affects the neurological system. And principally it affects the parasympathetic nervous system. If you think about the nervous system in your body, it's broken down into two different parts. One is the sympathetic nervous system. And that's the part of the nervous system that's often described as the fight or flight part of your nervous system.

When the sympathetic nervous system is activated, it prepares the body to either run or fight from an evolutionary standpoint. So when that part of the nervous system is activated, it does things like increase your heart rate, increase your breathing, makes your pupils go wide open so you can see better, makes your brain more aware and more awake. That's the sympathetic nervous system.

The parasympathetic nervous system is the opposite. It's the part of the nervous system that's activated when there is no threat in front of you. You're under no stress. And so when that part of the nervous system is activated, it

promotes things like digestion and so your bowels would move at a quicker and -- and faster rate. It also relaxes muscles, some muscles in general.

And in organophosphate toxicity, organophosphates do affect both of those different systems, parasympathetic and sympathetic, but they affect the parasympathetic nerve system much more. And in organophosphate toxicity you would get signs and symptoms such as an upset stomach, nauseous, having diarrhea. Other symptoms that you have would be profuse sweating, increased salivation, increased tearing.

The other thing you can get with organophosphates is you get increased secretions all over your body, but you can get increased secretions within the lungs as well. So oftentimes the lungs will fill with fluid, and that fluid is being secreted from the lungs themselves.

The third thing you can get with organophosphate toxicity is it can affect the brain. And that mechanism is not well understood, but it can cause mental status changes or even a coma.

Q. Okay. When you say sympathetic and parasympathetic nervous system, is that also known

as muscarinic or nicotinic?

A. Those are the receptors that are affected. Yes.

Q. Would you explain that to the jury.

A. The receptors that are activated in organophosphate toxicity, one is called the "muscarinic receptor." And that's the receptor of the parasympathetic nervous system. A receptor is like a docking station. And it will receive molecules. And if it receives the right molecule, it will activate whatever it's attached to.

So if we talk about parasympathetic nervous system, we're talking about muscarinic receptors. If we're talking about the sympathetic nervous system, you know, organophosphate toxicity, we're talking about nicotinic receptors.

Q. Okay. The jury has heard from several doctors that the signs and symptoms of organophosphate toxicity can sometimes mirror or be very similar to the signs and symptoms of heat stroke. Would you agree or disagree with that?

A. There are certainly some crossover between the signs and symptoms.

Q. Okay. And let's talk about that. This is a chart that was used with several of the

149

doctors who have testified here.

Can you see fatigue and weaknesses in both disorders, heat illness and organophosphates?

A. Yes.

Q. Can you see malaise, which is described as a general feeling bad, in both?

A. Yes.

Q. Nausea, vomiting, abdominal cramps?

A. Yes.

Q. Vertigo and dizziness?

A. Yes.

Q. Headache?

A. Yes.

Q. Can you see muscle cramps and twitching in both cases of heat illnesses and organophosphate toxicity?

A. You can see muscle twitching as well in organophosphate toxicity.

Q. Okay. And we've already discussed dehydration and electrolyte imbalances in heat illnesses. What about in organophosphates?

A. Can you have electrolyte abnormalities as well?

Q. Yes.

A. You can have some, but it's not

150

associated with severe dehydration.

Q. Okay. And then moving into heat stroke, we talked about the altered mental status. Will you see that also in organophosphates?

A. Yes.

Q. The jury has heard of some other medical terms, like metabolic acidosis. Can you tell the jury what that is.

A. And metabolic acidosis means that the pH or acidity of your blood is lower than it should be. And that's typically because you're either producing too much acid, like lactic acid, or you're ingesting an organic acid.

Q. And can you see that in both disorders?

A. Yes.

Q. And the jury has also heard something called a -- and I never pronounce it correctly -- rhabdo?

A. Yes.

Q. How do you say it?

A. Rhabdomyolysis.

Q. And what is that?

A. It's, basically, breaking down of muscle, so you get muscle markers that are in the blood and urine.

151

Q. Can you see that in both disorders?

A. You can. Yes.

Q. What about elevated creatinine?

A. Yes.

Q. What does creatinine indicate?

A. It's a marker of your kidney function.

Q. So if you have elevated, what does it mean?

A. It can mean that you have some decreased function of your kidneys, but you can also see it elevated in dehydration.

Q. You can also see that in both instances, organophosphate toxicity and heat illnesses?

A. Yes. For two different reasons. Yes.

Q. Okay. And we'll get back to that. Also acute renal failure in both?

A. Yes.

Q. The jury has also heard about something called "disseminated intravascular coagulation," "DIC"?

A. Yes.

Q. Would you tell the jury what that means.

A. DIC, or disseminated intravascular coagulation is the initiation of an abnormal clotting cascade or excessive blood clotting within

152

the body. It can be associated with many different things and is often initiated in the late stages of a severe illness.

How it manifests is that typically you get injury to the blood vessels of the body. The lining -- the endothelium is injured. With that injury -- or that injury sets off this abnormal clotting or coagulation cascade.

In the beginning of DIC you can see blood clots. And at the end stages of DIC when you've exhausted or used all your clotting factors, you see bleeding all over the body. You can see it in the gastrointestinal tract, in the lungs, and in the brain.

Q. You used the word "endothelia." Can you tell the jury what that is.

A. The endothelium is the inside lining of the blood vessels of the body.

Q. Okay. And can you see that complication, DIC, in both cases of heat illnesses and organophosphate toxicity?

A. Yes.

Q. I believe Dr. Cutshall testified that you see it commonly in critically ill patients. Would you agree or disagree with that?

153

A. **I agree.**
Q. Okay. Tachycardia. What is that?
A. **Fast heart rate.**
Q. And bradycardia?
A. **Slow heart rate.**
Q. And can you see tachycardia and bradycardia in organophosphate toxicity?
A. **Yes.**
Q. And when would you see one as opposed to the other?
A. **It really depends on what message the heart is receiving. As I said, organophosphates can affect both the parasympathetic and the sympathetic nervous system. So at any given time -- if at any given time with organophosphate toxicity the sympathetic nervous system is more simulated than the parasympathetic, you will have a high heart rate or tachycardia.**
If the converse is true, if the parasympathetic nervous system is preferentially activated, you can have a slow heart rate. So oftentimes in the clinical course, a patient could have organophosphate toxicity. You can see both.
Q. So when you say -- if parasympathetic is activated, you mean muscarinic?

154

A. **Yes.**
Q. And if the muscarinic is activated, which will you get? Bradycardia or tachycardia?
A. **Bradycardia.**
Q. And if the sympathetic or the nicotinic receptor is activated, which do you get?
A. **Tachycardia.**
Q. So if hypothetically Dr. Dickson on May 10 testified that if you get the muscarinic receptors, you can get tachycardia, and then was asked, so if it activates the muscarinic, what are you saying? It's bradycardia or tachycardia?
And answered, you can have tachycardia with it. Would you disagree or agree with that?
A. **Well, if you activate the muscles surrounding the muscarinic receptors, you'll have bradycardia.**
Q. Okay. So did Detective -- Dr. Dickson reversed it?
A. **Yes.**
Q. Now, which are you going to see in a case of heat stroke?
A. **Tachycardia.**
Q. Not bradycardia?
A. **Not -- No. Not in the -- not in the early stages of heat stroke. Yes.**

155

Q. Okay. Now, you talked about the blood pressure of Liz Neuman as being inconsistent with heat stroke?
A. **That's correct.**
Q. And would you explain to the jury first what you would expect to find in heat stroke.
A. **In heat stroke, since the patients are severely dehydrated and their blood volume is less than you would normally have secondary to fluid or water loss from sweating, you would expect them to have a low blood pressure, and you would also expect them to have a fast heart rate. The fast heart rate is trying to compensate for the low blood pressure, so that's why you have those two together.**
Q. And what did you find with Ms. Neuman?
A. **She had a documented high blood pressure, systolic -- high systolic pressure in the emergency department.**
Q. Do you remember how high it was?
A. **It was 240 degrees millimeter of mercury. And I think I had mentioned earlier that the normal is really about 120 or 130.**
Q. Was that significantly high, then?

156

A. **Yes.**
Q. Was there any set of circumstances in the medical records for Ms. Neuman that would explain that high blood pressure if it was a case of heat stroke?
A. **No.**
Q. Lastly -- or not lastly, second to the last, on the left-hand column, you indicated earlier that you would typically see normal to dilated pupils in heat stroke?
A. **Yes.**
Q. What would you typically see in the case of organophosphate toxicity?
A. **Pinpoint pupils.**
Q. Okay. Now, are you telling the jury that you would never see pinpoint pupils in a case of heat stroke?
A. **No.**
Q. What are you telling them?
A. **I'm telling -- what I'd like to tell you is that you can have large pupils, normal sized pupils, and in some cases small pupils. The majority of people who have heat stroke will have normal or increased pupils upon presentation.**
Q. The jury has heard from the ICU doctor,

Cutshall, who said that the pinpoint pupils was a red flag for toxicity. Would you agree or disagree with that?

A. I agree.

Q. Okay. So would you see it more commonly in the case of poisoning of organophosphates than in the case of heat stroke?

A. Yes.

Q. Lastly, on the left-hand column, can you see respiratory failure in both cases of heat stroke and organophosphate toxicity?

A. Yes.

Q. Okay. Now, we've explained to the jury that you can have signs and symptoms that can point to heat stroke or point to organophosphates. How -- if you can, how do you differentiate between the two? What are the other medical facts to differentiate between the two?

A. Well, I'd like to talk about respiratory failure too --

Q. Sure. Go ahead.

A. -- if I can.

And I did say that respiratory failure can be a component of both heat stroke and of organophosphate toxicity. The difference between

those two entities, however, is that in heat stroke respiratory failure is something that happens later on in their hospital course. It's not something that you see in the beginning. So you might start seeing respiratory failure a few hours at the earliest after presentation.

In organophosphate toxicity, this is something that you would see almost right away. It's a presenting sign. It's very common in organophosphate toxicity. And much of it has to do with the fluid that's being secreted into the lungs.

So in this case, the critically ill patients, all of them had respiratory failure, and some of them had very prominent pulmonary edema or fluid emanating from their lungs early in the course. And that was documented at the scene.

People described a couple of the critically ill patients as having foam coming from their mouth, and that's very significant pulmonary edema and something you would not expect to see in heat stroke.

Q. When you said it was documented -- let me give you also the additional facts as heard by this jury. If witnesses have testified that they

observed Kirby Brown, James Shore, Liz Neuman, Tess Wong, Stephen Ray, and Sidney Spencer all foaming or showing frothy sputum at the mouth, is that -- at the scene, is that significant?

MR. HUGHES: Objection. Misstates the testimony.

THE COURT: Again, ladies and gentlemen, the -- you will determine the evidence. It's your decision.

And you may answer the question, Dr. Paul, if you can.

THE WITNESS: Demonstrating significant pulmonary edema or foaming at the mouth is significant in this case and more consistent with organophosphate toxicity.

Q. BY MS. DO: If you were to see -- and you lecture on pulmonary edema?

A. Yes.

Q. If you were to see pulmonary edema in a case of heat stroke, you told us that it's a late-stage finding, when would you see it, then, in a case of heat stroke?

A. It really occurs for two reasons in heat stroke. One, you have to remember that the primary treatment -- or one of the primary treatments for

heat stroke apart from cooling the patient down is rehydrating them. So they receive several liters of fluid when they're being resuscitated. Sometimes they're given too much fluid, and that fluid leaks into the lungs and causes pulmonary edema. That's a common side effect of being aggressively rehydrated.

The second reason that patients with heat stroke would get respiratory failure is secondary to a process called "ARDS," or acute respiratory distress syndrome. And that's something that occurs days after the initial event. And it can start two, three, four more days after the -- after the beginning of heat stroke.

So for those two reasons, respiratory failure is not something that you would see in the beginning of the course of heat stroke. It's something that you're going to see later on, either a few hours or several days after presentation.

Q. So based upon your review of the medical records for the critically ill, are you able to eliminate pulmonary edema brought on by ARDS, acute respiratory distress syndrome?

A. Yes.

Q. Okay. And based upon your review of the

records and the circumstances at the scene where the critically ill and the decedents were seen foaming or having frothy sputum -- assume that for this question -- frothy sputum or foaming at the scene before any hydration or resuscitation is provided, does that eliminate the second reason for pulmonary edema in heat stroke?

A. And the second reason being?

Q. Aggressive rehydration.

A. That eliminates that possibility. Yes.

Q. Okay. So is it your opinion, then, in reviewing the medical records and the circumstances that the foaming or the frothy sputum seen at the scene is consistent with pulmonary edema in which case?

A. In organophosphate toxicity.

Q. Is pulmonary edema different than the excessive salivation that we see in organophosphates? And the jury has seen -- and we'll bring it up. They've heard of a mnemonic called "SLUDGE" or "DUMBBELL" where the "S" -- I'm sorry, where the "L" stands for lacrimation.

A. Yes.

Q. And that would be excessive tearing?

A. Yes.

Q. And then there is salivation -- excessive salivation.

A. Yes.

Q. Is there a difference between salivation, which occurs in the mouth and the pulmonary edema that we're talking about?

A. Yes.

Q. Would you explain that to the jury?

A. Sure. Salivation is just fluid that's produced by the salivary glands of the mouth. They're underneath the skin and muscles -- or the membranes and muscles of the mouth. And those secretions come directly into the mouth.

Those fluids are not moving backwards necessarily into the lungs for a couple of reasons: One, it's easier for the fluid to come out of the mouth itself.

And the second reason is that there is something in the body called an "epiglottis" which covers the trachea. And the epiglottis is there to prevent unwanted fluids or food entering the airway.

Where that fluid comes from in organophosphate toxicity is from the lungs themselves. In the lungs are glands that also

produce fluid, and they're activated by organophosphate toxins. And so that's the origin of the pulmonary edema and fluid in the lungs with organophosphates.

Q. So if a doctor testified in this case that organophosphate kills people because they literally drown on their own spit, would you agree or disagree with that?

A. I would disagree with that.

Q. And could you tell the jury why.

A. Because really where the fluid is coming from is from within the lungs themselves, and that's why it's called "pulmonary edema." It's not emanating from the mouth.

Q. So you would disagree if a doctor testified that you start to drown in your own spit, you can't breath because there is too much saliva in your lungs, that's saliva that's going down and clogging your lungs?

A. That's correct. Yes.

Q. Okay. The pulmonary edema in the case of organophosphate toxicity has to do with the fluids emanating from the lungs itself?

A. That's correct. Yes.

Q. If a doctor testified in this case that

if somebody is suffering from organophosphate toxicity, EMS or emergency personnel would not put a mask on them because that would, essentially, kill them, would you agree or disagree with that?

A. I would disagree with that.

Q. Would you tell the jury why.

A. One of the treatments for pulmonary edema is providing supplemental or extra oxygen to the lungs. The fluid in the lungs or edema fluid limits the amount of oxygen that can cross -- that can go across the lungs and into your blood. By providing supplemental oxygen through an oxygen mask, it would help deliver more oxygen to the body.

Also, if you look at an oxygen mask, they're typically used by EMTs and hospitals. They have holes in them. It's not a closed system. So if there was any frothy fluid present in the mouth, it could easily come through the mask.

So it's really the converse. If somebody has pulmonary edema and is having trouble breathing, an oxygen mask would be helpful in that circumstance.

Q. Now, you've already told the jury that you do not die of organophosphate toxicity by

drowning on your own spit. What is the mechanism of death in OP toxicity?

A. The primary mechanism of death is respiratory failure.

Q. And how does that occur?

A. Well, it's twofold. One, you can have very prominent pulmonary edema, which can limit the amount of oxygen that your blood can absorb. And we just talked about that.

You can also have paralysis of the respiratory muscles, like the diaphragm. And if you paralyze the muscles -- or muscles like the diaphragm, your lungs can no longer move correctly, like a bellows, and air is unable to enter and exit the lungs.

So for those two reasons you die of respiratory failure.

Q. What is it that causes the diaphragm to be paralyzed?

A. The organic toxin, its direct effect on the muscarinic receptors and the parasympathetic nervous system.

Q. Okay. Now, when we talk about organophosphate toxicity -- first of all, where do you commonly find that compound or chemical?

A. Pesticides.

Q. Okay. Would that include industrial and home use?

A. Yes.

Q. And do you know that from personal knowledge?

A. Yes.

Q. Are there more than one way -- more than one way to become affected or poisoned by organophosphate, meaning more than one route?

A. Yes.

Q. Could you tell the jury how many and what they are.

A. Well, the principal routes would be absorption through -- or one of the principal routes would be absorption through the skin. So if an organophosphate comes in contact with the skin, it can move through the skin and into the bloodstream.

Another possible exposure route is by ingestion. If you drink organophosphate, it can be rapidly absorbed in the body.

Another possible route is aerosolization or emitting the organophosphate into the air and it's breathed into the lungs.

Q. Inhaling it?

A. Yes.

Q. Going to the first route that you spoke about, absorption through the skin, would it make a difference if you are in a heated and hot -- or humid environment to the rate of the absorption?

A. Yes.

Q. How so?

A. It can speed up absorption markedly. It's well-known that medications, particularly medications that are placed in dermal patches, their absorption can be markedly accelerated by placing a heating source over them. It's probably because by placing a heat source on the skin, you're increasing the blood supply to that area, so more of the toxin is entering the bloodstream at any given time.

But it is well-known that heat and humid environments would accelerate absorption of medications and toxins.

Q. So hot, sweaty skin. Would that increase or decrease absorption of a toxin, like organophosphates?

A. Increase.

Q. The jury has heard the various signs and

symptoms you can see in organophosphate toxicity using the mnemonic of SLUDGE and DUMBBELLS. Are you going to see each and every one of those signs and symptoms in the case of organophosphate toxicity?

A. No.

Q. Would you explain to the jury.

A. When -- one reason is that it really depends on the dose of the organophosphate toxin that was ingested or absorbed.

The other reason is that people are different. Everybody's physiology is different. And some people could manifest some symptoms more prominently than others.

And so for those two reasons not everybody will manifest the same symptoms of organophosphate toxicity.

But there are some symptoms that are consistent. One is the affect it has on the pupils. And I think I've said this earlier that up to 80 or 85 percent of people that ingest organophosphates have small pupils at some point in their clinical course.

And so some symptoms are almost always seen, and some can vary from patient to patient.

Q. The symptoms that are almost always seen would include what?

A. So pupils is a very common one. And with larger ingestions, central nervous system effect -- or the effect on the brain is fairly uniform too for organophosphates.

Q. Let me ask you another question, Doctor. Well, I'm just going to put up here the symptoms using SLUDGEM. Do you agree that it stands for salivation, lacrimation, urination, defecation or diaphoresis, and GI upset, emesis, and miosis?

A. Yes.

Q. So depending on the route of exposure, the dosage, and the compound, you could see any variation of these signs and symptoms from patient to patient?

A. That's correct. Yes.

Q. Okay. Now, you know from your view of this case that we're talking about a sweat lodge ceremony.

A. Yes.

Q. And there were approximately 55 participants inside?

A. Yes.

Q. We know that three deceased and three

were critically ill?

A. Yes.

Q. If hypothetically the case agent in this matter ruled out toxins before consulting with an expert because he believed that if it was toxins or poisons, everyone inside the sweat lodge would have been affected, would you agree or disagree with that?

A. I would disagree with that.

Q. Could you explain for the jury why.

A. And as I talked about before, there are different routes to become exposed to organophosphates. Certainly if the organophosphate was aerosolized in a contained room, you would expect most everybody to be affected.

But if the route was dermal absorption or skin absorption, only those people who touched the organophosphate would be affected. So it's not surprising to me that only a few people were affected in this circumstance.

Q. Okay. So if, for example -- actually, let's use an exhibit that Mr. Li used during the testimony of one of the participants.

This is Exhibit 1080, Dr. Paul, that was used during the testimony of Dawn Gordon, a

participant of the sweat lodge ceremony. And assuming for the purpose of this question that Ms. Gordon and other witnesses testified that -- first of all, let me give you some background.

Assume that the sheriff's office measured the sweat lodge ceremony, and it's 23 inches -- sorry. 23 feet in diameter.

A. Yes.

Q. The entrance to the sweat lodge ceremony is what we've been referring to as the 6:00 o'clock position.

A. Yes.

Q. Witnesses, including Ms. Gordon, with this exhibit indicated that Tess Wong and -- that would be Sean Ronan -- but Tess Wong and Kirby Brown and James Shore and Sidney Spencer, four of the critically ill and/or decedents, sat in the 12:00 o'clock.

A. Yes.

Q. Okay. I also want you to assume that Liz Neuman, the other decedent, was sitting at the 9:00 o'clock position.

A. Okay.

Q. And Stephen Ray was sitting in the area of the 3:00 o'clock position.

Would you explain to the jury that if hypothetically the organophosphate is absorbed through the skin because it's in the ground, how would it be that not everyone would be affected?

A. And the only people that would be affected would be those people who came in direct contact with the compound. Simply being in the vicinity of the organophosphate that's present in the ground probably isn't enough to become significantly symptomatic. You would really have to have your body in direct contact with the compound.

Q. Are there different parts of the body that will have different absorption rates?

A. Yes.

Q. And how would you explain that?

A. The thinnest areas of the body -- or coverings of the body would be the quickest route of absorption, so the mucus membranes of the mouth or nose rapidly absorb compound because they're so thin.

The thickest areas of skin on the body would be the slowest areas when it comes to absorption.

The other factor to consider is how much

blood supply a given area of the body has. Areas such as the face are highly vascular, meaning there is a lot of blood that goes into the face. Some areas such as the buttocks would have less of a blood supply.

And so two principle factors: One is thickness of the skin or mucus membrane. The second would be vascularity, how much of a blood supply does that area have.

Q. So you would include in there whether or not the actual ground itself is exposed to the organophosphates?

A. Yes.

Q. And it could be that it's not uniform throughout the sweat lodge floor is what you're saying?

A. Yes.

Q. You are also saying that it depends on which area of the body is exposed. So if somebody is sitting on their rear end as opposed to someone who is curled up in the fetal position with their face in the ground, is there going to be a difference in the absorption rate assuming that they're sitting over ground that has organophosphates?

A. They probably would have a different rate of absorption. I would expect much less absorption in the area of the buttocks due to the thickness of the skin, but also the decreased vascularity of that area.

Anybody who had their face or mucus membranes close to the source would more rapidly absorb that compound. Yes.

Q. Okay. Now, when you reviewed the medical records, you saw pinpoint pupils?

A. Yes.

Q. And that was for Mr. Ray, Ms. Neuman, Ms. Spencer and Ms. Wong?

A. Yes.

Q. Mr. Ray, based upon his EMS record -- did you note whether or not he was pinpoint in the field, according to the record?

A. I'd have to consult the record --

Q. Please do that.

A. -- to answer that question.

Q. Doctor, if I may approach, I'm going to give you Exhibit 213, which is Mr. Ray's complete medical records that you have noted.

A. Yes.

Q. Okay. And what page are you at?

A. 709[illegible].

Q. Okay. And that's Exhibit 213?

A. Yes.

Q. Are we looking at the page that indicates the emergency notations or the EMS notations?

A. Emergency.

Q. Okay. Let's -- and where do you want me to direct the jurors' attention?

Okay. So in the emergency room, he was noted to have pinpoint pupils --

A. Yes.

Q. -- consistent with organophosphates?

A. Yes.

Q. My question is, did you know whether or not in his EMS records prior to admission to the ER what his pupil size were?

A. I don't recall in the EMS records. I'd have to look at those.

Q. Let me approach you again with 213 and direct your attention to Bates stamp 6996.

A. His pupils are noted to be 7 millimeters on the left and 7 millimeters on the right.

Q. Is that consistent or does that change your opinion that the pinpoint pupils observed at the ER is consistent with organophosphate toxicity?

A. No. It does not change my opinion.

Q. Would you explain to the jury, please?

A. Yes. So what I'm pointing out here in the EMS record where it says, 7 millimeters on the left and 7 millimeters on the right, that actually would be considered a dilated pupil or a large pupil.

What's important when we're talking about constricted or small pupils is that it happened sometime in the clinical course. It's not something that's going to last or possibly last the entire course. And it might be something that takes a little while to take effect as well. The key component is that at some time in their clinical course they had those constricted pupils.

In this case it's possible that at this given time his nicotinic or sympathetic nervous system was being preferentially activated in that area, and then later on when he was in the emergency department that his parasympathetic or muscarinic receptors were now being preferentially activated and he had pinpoint pupils. The key finding is that at some point he had pinpoint pupils.

Q. Thank you, Doctor.

177

In terms of -- and we've gone through now your explanation of respiratory and pulmonary edema, the miosis. You also told the jury earlier when we went through giving them a road map to your conclusion that the early and transient comatose stages seen was also inconsistent?

A. Yes. That's correct.

Q. Okay. Let's talk about that. And let me get back to that page. Okay. So we've already talked about no clinical evidence seen of heat stroke and clinical evidence inconsistent with heat stroke. We talked about the respiratory and pulmonary edema.

The high blood pressure seen in Ms. Neuman --

A. Yes.

Q. -- and her pinpoint pupils.

Could you explain to the jury why it is that the presentation of coma or comatose in the critically ill -- Mr. Ray, Ms. Spencer, and Ms. Wong -- was inconsistent with heat stroke?

A. So at the scene of these four critically ill patients, they were all described to be either comatose at the scene or becoming comatose at the scene. So they're becoming comatose shortly

178

after -- either in the sweat lodge or shortly after leaving the sweat lodge. That's the time frame for them becoming comatose.

As I talked about in heat stroke, you can become comatose or have mental status changes for two different reasons:

One is that severe dehydration causes an increase in your electrolytes -- or concentration of your electrolytes, and they can cause brain swelling or changes in mentation and even coma. So that's one mechanism for heat stroke to cause a coma.

The second is that in heat stroke, the heat itself can be directly toxic to the brain cells, meaning that it can directly kill them. And as those brain cells are killed, you have changes in mentation, and ultimately you become comatose. So that's how you can become comatose in heat stroke.

In organophosphate toxicity, it's a very common side effect of the poisoning, and the comatose state can start pretty shortly after the ingestion or exposure. It happens early in the course of the toxicity. So for that reason, it's much more consistent with organophosphate toxicity

179

and much less consistent with heat stroke.

The other factor to consider too is that in the three critically ill patients that recovered, who are comatose and then recovered, they didn't have any evidence of brain damage. They recovered fully from a neurological standpoint. So that virtually rules out the fact that they had brain injury from being exposed to heat.

If they had killed brain cells because of the prolonged exposure to heat, they would have had long-term sequela or complications from that process.

Q. When you looked at the medical records for Mr. Ray, Ms. Spencer, and Ms. Wong, you observed that they were either comatose in the field or presented to the ER comatose?

A. Yes.

Q. And what was done in terms of medical treatment to respond to that condition?

A. From an intervention standpoint, they were intubated or a breathing tube was placed.

Q. Okay. And what is intubation?

A. Intubation is placing a tube through the mouth and into the trachea to assist somebody in

180

breathing and delivering oxygen.

Q. And at some point were they taken off of that assistance to breathe?

A. Yes.

Q. And what do you call that?

A. Extubation.

Q. For Ms. Spencer, do you know how long after she presented as comatose, was intubated but she was then extubated?

A. Approximately six hours.

Q. For Ms. Wong, do you know how long after she presented as comatose that she was intubated, that she then was extubated?

A. And I believe she was extubated sometime the next day. But I would have to go back to the record. And -- but she had other complications to consider.

Q. And what were those?

A. She had a partial collapse of her lung. So she might have -- they might have kept the breathing tube in there a little bit longer until they were sure that that partial collapse of the lung was either fixed or it wouldn't cause a problem when they took the breathing tube out.

Q. What would have caused the collapsed

lung?

A. And I'm not sure what the mechanism was in this case.

Q. Can that result during the course of intubation?

A. It would be -- it may be associated, but it's not a common complication.

Q. Okay. Let me give you Ms. Spencer and Ms. Wong's medical records, 396 for Ms. Wong and 222 for Ms. Spencer.

You've already told the jury that Ms. Spencer was extubated almost six hours after she's presented in a comatose -- and when we say "comatose," do you mean the person showed up in a coma as opposed to just fainting?

A. Yes.

Q. And so how many hours after Ms. Wong was intubated that she was then extubated?

A. So I would have to go back to the record.

Q. Please do that.

Your Honor, when is the next break?

THE COURT: We'll take two briefer breaks today, so in the next 10 minutes or so.

MS. DO: Thank you.

THE WITNESS: It's going to take me a little

while to --

Q. BY MS. DO: Sure.

THE COURT: Maybe we should go ahead and announce.

MS. DO: Thank you, Your Honor.

THE COURT: We'll go ahead and take the initial break this afternoon. Please be reassembled at 10 till. We'll start as soon as we can after that. Remember the admonition.

And we'll be in recess.

Thank you.

(Recess.)

THE COURT: The record will show the presence of Mr. Ray, the attorneys, and the jury.

Dr. Paul has returned to the stand.

Ms. Do.

MS. DO: Thank you, Your Honor.

Q. Dr. Paul, thank you. I appreciate your patience throughout. We've had a lot of ground to cover, and we're almost done.

I wanted to make one correction. At the break Ms. Rybar indicated to me this cup is actually 10 ounce. I think I said 14 ounce. The cups may have changed since that witness testified. But either way, if it was a 10-ounce -- 2 cups,

10-ounce or 2 cups, 12 or 2 cups, 14-ounce of water splashed onto Ms. Neuman's chest, would that change your opinion that the circumstances would not have explained her lack of a elevated core temperature?

A. No. It would not change my opinion.

Q. Okay. Before we took the break, we were talking about the three critically ill -- Mr. Ray, Ms. Spencer, and Ms. Wong -- who all presented to the Flagstaff Medical Center ER in a comatose state.

A. Yes.

Q. And over the break have you had a chance to review their medical records?

A. Yes.

Q. Do you now, based upon your review, recall when it was that Mr. Ray, for example, was extubated, meaning taken off of assistance to breathe?

A. The following day on the 9th of October.

Q. And did he snap out of the comatose stage?

A. Yes.

Q. And when -- when did that occur?

A. The following day with --

Q. With --

A. With extubation.

Q. Okay. Reviewing Ms. Spencer's record, you indicated she was extubated six hours after she presented to the ER in a comatose stage?

A. Yes.

Q. And so when she was extubated, did she snap out of this comatose stage?

A. Yes.

Q. For Ms. Wong, have you had a chance to review her medical records to see when it was that she was extubated?

A. Yes.

Q. And when was she extubated?

A. I didn't find documentation of the actual extubation in the medical record.

Q. Based upon the other documentation, did it appear to you whether or not she snapped out of the comatose stage?

A. Yes.

Q. Okay. Now, I want you to try to explain to the jury why -- is this a puzzling piece of fact to you?

A. I think it's an interesting fact, and I think that it's an important fact. I'm not sure I would call it "puzzling." And the reason I say

185

it's important is because, A, we've talked about the mechanism of developing a coma in heat stroke. A, it develops in severe dehydration. And we see no evidence at all of severe dehydration in any of these patients.

The second mechanism was brain injury, that being exposed to high heat for an extended period of time can kill your brain cells. If these patients were comatose because they were brain injured or their brains were injured, they would have long-term sequela, meaning that they would have neurological or brain complications that lasted after their hospitalization.

All three of these critically ill patients seemingly recovered back to their normal state within -- between 6 and 24 hours. And I think that's a very significant fact. What it suggests is that -- that this was possibly a toxin inducing this comatose state. That would be a very typical course for a toxin exposure.

The toxin is introduced into the body. It induces a comatoselike state. The toxin is broken down or is metabolized. It goes away. The patient wakes up. So it's much more consistent with a toxin exposure than with heat stroke in this

186

case.

Q. You had earlier in the morning, if I recall correctly, explained to the jury that brain injury, as seen in the case of heat stroke, one is reversible and the other is not reversible?

A. That's correct.

Q. So if a patient, such as these three critically ill, came into the ER all in a deep coma or a comatose stage and snaps out of it, would you call that reversible or not reversible?

A. Reversible.

Q. Okay. So if we're talking about reversible, I believe earlier you told us that that would only occur if the brain injury is caused by severe dehydration for the case of heat stroke?

A. Yes.

Q. And did you see any evidence of severe dehydration here?

A. No.

Q. So that would eliminate that. We now have -- I believe what you said earlier this morning was the second cause of brain injury in heat stroke is direct injury from the heat?

A. Yes.

Q. And that's not reversible?

187

A. That's correct.

Q. So if that had happened in this case with Mr. Ray, Ms. Spencer, and Ms. Wong, they would not have snapped out of the comatose stage in the short amount of time that you saw?

A. That's correct.

Q. With respect to these three patients, let me ask you this question: If Dr. Dickson testified that the demarcation between heat exhaustion and heat stroke is as soon as you get any mental status changes, you click that line where you start having mental status changes, you're going down that path of heat stroke, and you will go to death quickly in an hour.

Taking that statement, looking at Mr. Ray, Ms. Spencer, and Ms. Wong, who all snapped out of the comatose stage, are those cases consistent or inconsistent with what Dr. Dickson testified to?

A. I would say inconsistent. And the reason I say inconsistent is that there is no evidence that points to heat stroke causing this coma. There is no evidence of dehydration, and there is no evidence of direct injury to the brain. And I think that's the most inconsistent thing in that

188

statement.

Q. Well, for Mr. Ray and Ms. Spencer, there was, I think, as you noted, mild dehydration.

A. Right. But not significant dehydration. And the sodium concentration of those patients was absolutely normal.

Q. Were there any other medical facts in the case of Ms. Neuman that indicated to you consistency with organophosphate toxicity in her medical records?

A. With Ms. Neuman she was unresponsive and virtually comatose at the scene. She had documented pinpoint pupils, which is consistent with organophosphate toxicity, and she also had respiratory failure very early on in the course. And so those signs and symptoms are consistent with organophosphate toxicity.

Q. Was there anything else in the medical records, other than what we've already discussed, that is in common with all of these critically ill patients -- the mioses, the early foaming or pulmonary edema? Was there anything else specific in Ms. Neuman's records that showed you consistent with organophosphates?

A. Can I just consult my notes?

Q. Sure.
A. There was a statement in the ER record that said the patient was -- had cool skin and clammy skin. The direct quote was, skin cool, clammy. So both of those findings are inconsistent with the diagnosis of heat stroke.
The fact that her skin was cool points away from an elevated body temperature. And the fact that her skin was clammy, meaning moist, is -- would be very atypical for heat stroke.
Remember, I said one of the three diagnostic criteria was anhidrosis or lack of sweating. So if somebody really had heat stroke, you would not expect them to have clammy, wet skin.
Q. And are you referring to what I put on the screen as Exhibit 369, and this is Bates stamp 2594, skin is clammy, cold?
A. Yes.
Q. Anything else that you saw in Ms. Neuman's record that showed you it was consistent with organophosphate toxicity?
A. She was also experiencing diarrhea, which is one of the signs of organophosphate toxicity. And it's certainly not specific for organophosphate toxicity, but it's just one of the many things that

you can see. And I saw that you went through the DUMBBELL mnemonic and the SLUDGE mnemonic. Defecation and diarrhea are part of that mnemonic.
Q. Did you see any notation in Ms. Neuman's record of a cholinergic state?
A. Yes. There was mention of that on page 2923, that they felt she was in a cholinergic state -- or a cholinergic state would be consistent with an organophosphate ingestion.
Q. You said 2923?
A. 2923.
Q. And is this what you're referring to here? Patient appeared in cholinergic state upon arrival, red, pinpoint pupils, et cetera?
A. Yes.
Q. And the jury, I think, recalls from prior testimony heard this morning, cholinergic includes organophosphates?
A. Yes.
Q. So we've covered these three areas. And last is, is it your opinion -- or what is your opinion in terms of looking at all of the medical records in this case of whether or not the signs and symptoms include or excludes organophosphate toxicity?

A. All the signs and symptoms definitely would include organophosphate toxicity in the differential diagnosis. In fact, every sign and symptom that the patients exhibited is consistent with organophosphate toxicity.
Whether we're talking about the constricted or small pupils, early respiratory failure, early reversible comatose state, one patient with high blood pressure, all of those findings are consistent with organophosphate toxicity.
Q. And you reached your conclusions and opinions that we've spent the most part of today covering after reviewing all of the medical records?
A. Yes.
Q. Now, let me ask you, we had earlier talked about how upon your review of the medical records of Ms. Neuman, you determined that it was incomplete?
A. Yes.
Q. Let me give you a letter that's dated May 19th addressed from me to you with enclosure of Ms. Neuman's medical records. Would you review that and tell me if that accurately reflects the

date, May 19, 2010, when you received the four volumes of Ms. Neuman's medical records, 365 to 368?
A. Yes.
Q. And so that's the date of May 19, 2010. The autopsy report you reviewed for Ms. Neuman was dated February 2, 2010?
A. That sounds correct. I'd have to check that.
Q. Okay. So does it appear that the complete medical records for Ms. Neuman was provided some four months after the autopsy report was written on February 2nd?
A. Yes.
Q. Mr. Ray's records -- Stephen Ray's records, you also discovered in reviewing what I provided you in May of 2010 that it was incomplete?
A. Yes.
Q. I'm going to show you a letter dated February 4, 2011, from myself to you enclosing the complete medical records for Mr. Ray.
A. Yes.
Q. And that would be Exhibit 213; correct?
A. Yes.
Q. So you received Mr. Ray's complete

193

medical records in which you had seen the evidence of the pinpoint pupils and all the other signs and symptoms that we talked about?

A. Yes.

Q. Now, I also provided you at some point with the reports of Dr. Dickson. For identification, I'm going to show you Exhibits 1011, 1012, and 1013. Are those the reports of Dr. Dickson?

A. Yes.

Q. And Dr. Dickson wrote his report on January 10, 2011.

A. That's correct. Yes.

Q. And so Mr. Ray's complete medical records were provided to you also after Mr. -- I'm sorry, after Dr. Dickson wrote his report?

A. Yes.

Q. So you didn't have it at the time you wrote your report on January 10 as well?

A. That's correct.

Q. Did you note that in your report?

A. Yes.

Q. The last area that I'd like to cover with you, Dr. Paul, and then I'll turn it over to Mr. Hughes, in reviewing the over 5,000 pages of

194

record in this case, you've reached your opinion and conclusion that we've covered.

You told us this morning that you weren't criticizing the medical examiners or the doctors that were treating these patients?

A. That's correct.

Q. But having reviewed the record, as a medical examiner investigating cause of death, would you have done anything differently?

A. The things that I would consider doing differently in this case would be expanding the differential diagnosis or the possibility for causes of death and illness. And with -- and I think you have to understand that I'm in a much better position probably than the medical examiners were at the time. I'm privy to all the information that's available in this case, so I'm speaking from that standpoint.

But with the information that I have now, I would have definitely pursued organophosphate or an organophosphatelike compound as being involved in the death of those three decedents and injuring the other three. You can test for organophosphates in the blood at the time of -- at the time of autopsy.

195

The likelihood of you finding organophosphates is much higher if you do it shortly after the deceased's time of autopsy. The longer you wait, the less likely you are to be able to discover it because it breaks down rather quickly and is unstable over time. And that time will vary depending on what type of organophosphates you're talking about. But I would have pursued that possibility.

If at the end of the day, even with the organophosphates testing, that came up negative, I probably would have just ascribed the death of undetermined in this case. I think the evidence is so compelling that another -- or a substance is involved in this death that I probably would not have ascribed a definite cause of death in this case.

Q. That would be heat stroke?

A. Yes.

Q. Now, you indicated that you had to test the blood early for organophosphates. And you base that on what, sir?

A. The presenting signs and symptoms in this case.

MS. DO: May I have a moment, Your Honor?

196

THE COURT: Yes.

Q. BY MS. DO: I'm looking for an exhibit. I'm not finding it right away.

And, Dr. Paul, at some point while this trial was already underway, did I provide you with a copy of a letter from Mr. Hughes to Mr. Li regarding the testing of organophosphates in this case?

A. I've seen the -- I've seen a copy of that letter. I don't know exactly when that was provided to me.

Q. Do you recall the contents of the letter?

A. I believe the content of the letter referred to the unreliability of the testing that was done on the blood in this case looking for various organophosphates.

Q. And based upon the record in this case, including that letter, did it appear to you that the state tested the blood samples of the decedents some 17 months after the accident?

A. Yes.

Q. And based upon the passage of 17 months, how would that affect the ability of detecting organophosphates in the blood samples if it was there?

A. I think the short answer is that test would be very unreliable.
Q. And the letter that you saw written by Mr. Hughes, is that consistent with your opinion?
A. Yes.
MS. DO: May I have one moment, Your Honor?
THE COURT: Yes.
Q. BY MS. DO: All right. Dr. Paul, the last thing I'd like to do is we've spent all day discussing the medical records. And this chart that is Exhibit 1083 reflects your summary of the medical records?
A. Yes.
Q. And is it helpful to understand your opinions and conclusions that we discussed today?
A. Yes.
MS. DO: Your Honor, at this time, I'd move Exhibit 1083 into evidence.
THE COURT: Mr. Hughes?
MR. HUGHES: No objection.
MS. DO: Thank you, Your Honor.
And I have no further questions.
THE COURT: 1083 is admitted.
(Exhibit 1083 admitted.)
MS. DO: Thank you.

THE COURT: Thank you, Ms. Do.
Mr. Hughes, cross-examination?
MR. HUGHES: Thank you, Your Honor.
CROSS-EXAMINATION
BY MR. HUGHES:
Q. Good afternoon, Doctor.
A. Good afternoon.
Q. We met at the beginning of this year out in Los Angeles; is that correct?
A. That's correct.
Q. At the law office of Ms. Do and Mr. Li in Los Angeles?
A. Yes.
Q. And at that time we had an opportunity -- or I had an opportunity to ask you some questions about the case?
A. That's correct.
Q. And that was a week or two after you had prepared the report that Ms. Do had asked you some questions about?
A. Yes.
Q. Now, regarding that report, which, I believe, is dated January 10, 2011, how many -- what was the purpose for you in preparing that report?

A. Well, A, I was asked to prepare a report and summarizing -- summarizing my understanding of the medical records. And also the question was posed to me as to whether the medical records support the diagnosis of heat stroke.
Q. And based on your summary of the medical record, did you include, then, in this report that you prepared -- approximately how many pages was the report?
A. Eight pages, I think.
Q. And then there were -- there are some attachments to that, including a CV and that sort of thing?
A. Yes.
Q. In the report did you ever mention organophosphates?
A. No.
Q. Was there some reason you didn't mention organophosphates in the report?
A. I think one of the reasons was that I was -- that the medical records were still incomplete. I know at the time that I didn't have Stephen Ray's medical records. And so I recall that that was one of the reasons. And to tell you the truth, I was considering what possibilities

there were. I was considering what possible substances could cause this constellation of symptoms. And those are the two primary reasons.
Q. Now, when did you first begin your review in the case?
A. It was May of 2010.
Q. And at what point did you begin to reach the conclusions that you've testified to today?
A. The conclusion that the clinical data does not support heat stroke was really made early on. And I felt that the clinical data did not support that diagnosis necessarily.
Q. How about your conclusion that it could be organophosphates?
A. I would say that, basically, my opinion concerning that solidified somewhere around the time or after the time that I composed that letter. And the -- really the piece that I was waiting for was Stephen Ray's medical records.
Q. So apart from the remainder of Mr. Ray's records, is it correct, then, that you didn't believe organophosphates could be a factor until you saw those remaining records?
A. No. That was definitely in my differential diagnosis.

Q. And what was your differential diagnosis?
A. **Well, that organophosphates or an organophosphatelike compound could explain all the signs and symptoms that we see here. I also considered other things, like carbamates, even nicotine-based pesticides as well. But I was thinking of compounds that could cause this whole constellation of signs and symptoms.**
Q. Now, I believe that during our interview, I had asked you to provide a copy of the articles and the scientific sources you had researched in the case?
A. **That's correct. Yes.**
Q. Did you provide those to Ms. Do?
A. **She has some of those articles. Yes.**
MR. HUGHES: Can I --
Your Honor, may I approach the witness?
THE COURT: Yes.
Q. BY MR. HUGHES: Sir, I'm going to show you the -- it's marked -- or it's not marked, but four supplemental disclosure statements dated February 7th, 2011.
Was that shortly after our interview?
A. **I believe so. Yes.**
Q. Could you look through and tell me if

there were any scientific articles that you provided that were not in that list or not attached to it.
A. **I don't believe so.**
Q. Okay. I just want to make sure we're on the same page. And is it correct that your source for some of these articles was eMedicine?
A. **That's correct.**
Q. Can you tell us briefly what eMedicine is.
A. **EMedicine is a website that's created by physicians and reviewed by physicians. It's a reputable knowledge resource for physicians. The articles that are written there are kept relatively up to date, which is one advantage of the website. And they're also peer reviewed. So the articles that are present there are reviewed by other colleagues in emergency medicine in this case to make sure that the facts are consistent.**
Q. Did you have an opportunity to review the police reports in this case?
A. **Yes.**
Q. And did those include statements by the various witnesses?
A. **Yes.**

Q. And at some point I think you recently mentioned that a significant factor -- and correct me if I'm wrong. A significant factor for your testimony today is the fact that you believe that the -- of the surviving seriously ill patients, none of them suffered any long-lasting effects?
A. **That's correct. Yes.**
Q. Do you recall whether in interviews those patients indicated that -- or some of them indicated that they had suffered long lasting effects?
A. **I don't remember reading about any significant long-term neurologic sequela. No.**
Q. If Mr. Ray were to testify to the trial -- to this jury that he still suffers from memory problems after that, would you consider memory problems to be a long-lasting effect?
A. **The long lasting effects that you would expect from heat stroke, oftentimes they're primarily centered around the cerebellum. The cerebellum of the brain is that area of the brain that controls movement. And so injury to that area of the brain can cause movement disorders, unsteadiness on your feet, et cetera. And so that would be one of the most common long-term**

neurologic sequela would be problems with movement and balance. I think the problem with memory -- I'm not sure of the significance of that.
Q. What part -- you mentioned the cerebellum controls movement. What part of the brain controls memory?
A. **So there are multiple parts of the brain that are involved with memory. But hippocampus would be one of them. Mammillary bodies would be another one. And the correlations that I would try and make between memory loss and the effects of heat stroke would be that there could be, I guess, damage to the hippocampal area of the brain. But I'm not sure of that association between memory loss and the complications of heat stroke.**
Q. Would you expect as an emergency room doctor and also based on your training that if they -- if there is severe enough heat that it could damage the cerebellum? Would you expect to see some damage to other parts of the brain also?
A. **Well, the reason I say cerebellum is because the cerebellum usually is more sensitive to cellular injury than other areas of the brain. The two areas that are more sensitive are the cerebellum, particularly the Purkinje cells of the**

205

cerebellum, and also the hippocampus.

So it's possible and it's not uncommon that with permanent brain injury, those are the only areas that manifest it. The other areas have survived the insult. So I would expect the symptoms to manifest first in those areas and then later on in the other areas of the brain.

Q. And did you have an opportunity -- did Ms. Do provide you copies of the interviews that she provided -- that she conducted or her colleagues conducted of different people, like Mr. Ray, Stephen Ray?

A. Yes.

Q. And do you recall Mr. Ray -- Stephen Ray indicating in a December interview that he had some other problems at that time in addition to the memory problems?

A. I don't remember. I remember discussing that he possibly had some neurologic problems, but I don't remember it specifically. And at the time I didn't make a correlation between the two. No.

Q. Do you remember mentioning to Ms. Do in that interview that prior to the sweat lodge ceremony he didn't have memory problems?

A. I don't recall that. No.

206

Q. And would that change your opinion about whether he may have suffered some sort of long lasting brain injury?

A. If in true -- if, in fact, it's true that he had no memory problems before and now he has a difficult time with his memory and it tends to really make sense, then obviously I think it's reasonable to assume that there was some injury. But apart from that I can't comment further.

Q. Would that be a type of injury that you would expect to see from organophosphates?

A. Typically, no, as long as there were no significant respiratory problems with the organophosphate toxicity. And the cerebellum and hippocampus of the brain, as I said, are both very sensitive to injury. But it's not just heat injury. They're also sensitive to low oxygen concentrations.

So if somebody is having a difficult time breathing and they're not oxygenating their blood well, those are the first two areas that are injured. So there certainly could be other explanations of the mechanism of injury if, in fact, there was brain injury in that area.

Q. So if you had seen brain injury, then, assuming Mr. Ray testified to the jury that he still suffers from memory problems to this day, would that, then, no longer be one of the definitive factors that you testified to earlier?

207

A. No. That wouldn't change my opinion.

Q. What sort of long lasting effects would you expect to see, then, that you were talking to the jury about that could change your opinion?

A. Well, I think you're taking that issue in isolation. And, once again, we have to look at the big picture. And so, first of all, it's the timing of the injury as well as the time it takes to recover. As far as I could tell from the medical record, all of those patients were described as being normal neurologically. So now we're talking about very subtle changes which are difficult to objectively quantify. And --

Q. I'm sorry. Go ahead. I --

A. That's all right.

Q. You mentioned that all the patients. I presume you're talking about the severely injured patients who survived; correct?

A. That's correct. Yes.

Q. They were all described as being normal neurologically?

208

A. Yes. As far as I can tell from the medical record.

Q. Okay. With respect to Mr. Stephen Ray's records, do you have that in front of you?

A. His hospital record?

Q. Yes.

A. Yes.

Q. Can you tell us the page number -- the Bates number of the record that shows that he was described as being normal neurologically?

A. I don't have that written down. I guess what I'm referring to is that in some of the cases they were described as having no neurologic sequela. In other cases there was no documented description of a brain injury.

Q. Well, I believe, for example, Mr. Ray -- his medical records are Exhibit 213. Can you look through those and tell us whether he's one of the patients that was described as having no neurological problems?

MS. DO: Your Honor, I'm going to object as vague as to time. Are we talking about upon admission or upon discharge?

Q. BY MR. HUGHES: Well, let me ask you, Doctor, you indicated that the -- you believe you

saw a record that indicated he was neurologically normal?

A. Either neurologically normal or no documentation that there was any evidence of brain injury.

Q. Okay.

A. Looking -- I was looking for both of those.

Q. Okay.

A. So the area that I was referring to is on page 7085.

Q. Okay. And that's a discharge summary?

A. Yeah. And under hospital course, at the bottom it says -- and I have to read this in its entirety to make a point.

Q. Okay.

A. Due to his brain injury and low risk profile, we selected to not start ASA, or aspirin, at this time. He continued to show global postanoxic brain damage with dysarthria, double vision, gait disorder, and vertigo. CT and MRI of the brain failed to show any abnormalities. His symptoms entirely cleared on 10/11, and the patient states and seems to be doing great with no clear residual neurological sequela at this time.

Q. And do you know whether -- what some of the symptoms were that he suffered prior to the symptoms clearing?

A. I'm sorry. Could you repeat that?

Q. Did the records indicate the symptoms that he was suffering that apparently cleared?

A. Yes. Dysarthria, difficulty speaking, double vision, gait disorder, unsteadiness, vertigo, which is the feeling that the room is spinning. Those are the main symptoms.

Q. Do you know whether it's documented that the patient complained of having memory problems?

A. I did not see that. No.

THE COURT: Mr. Hughes and Dr. Paul, just a request from the jury. Apparently they're having a little bit of difficulty hearing you.

Doctor, I think the microphone -- you got away from the microphone.

THE WITNESS: I'm sorry.

THE COURT: That's okay.

Mr. Hughes, excuse me.

MR. HUGHES: Thank you.

Q. Doctor, if you would turn to page 7097.

A. Yes.

Q. And does that indicate that on

October 10th the patient indicated he was having trouble concentrating and having trouble remembering things with short-term memory?

A. It does say that. Yes.

Q. Would that be in addition, then, to the symptoms that were described on the previous page?

A. Yes.

Q. Now, if Mr. Ray were to have told Ms. Do that in December -- on December 22nd, which is the date of the interview, he still suffers from ringing in the head, headaches, no taste for food, little to no smell, aches and pains near his kidney area, are those other things that you would expect to see caused by heat stroke or organophosphates or none of the above?

A. Well, I think that -- and let me preface it by saying I'm not a neurologist. And this is not my area of specialty. It's not my specialty area, my specialty, in that it's certainly suggestive, if those symptoms were true and documentable, that something may have occurred and -- but they're really nonspecific. They wouldn't be specifically associated with heat stroke damage. There are certainly other things that could cause that type of brain injury, such as

hypoxia, which I've described before.

Q. So I guess my question is, then, I believe you indicated that the lack of long-term brain problems was a concern to you in reaching your decision. If you were to find that Mr. Ray was suffering from those things that he told Ms. Do about, would that make any difference to you?

A. No. It would not change my opinion. No.

Q. What if he were to have told Ms. Do also that when he drinks things like water, he chokes on it, same if he's chewing gum?

A. It would not change my opinion. No.

Q. What if he told Ms. Do that he still continued to have headaches?

A. That wouldn't change my opinion either.

Q. And chest pains?

A. Wouldn't change my opinion either.

Q. Now, with respect to Ms. Spencer, do you recall whether she gave a statement to Detective Boelts around October 29? Do you remember reading that?

A. I don't -- I don't recall that. No.

Q. Okay. If she had told Detective Boelts that around October 29th when she gave that statement she was still suffering with problems

213

from her kidneys, liver, and feeling in her right arm and left leg, blurry vision, headaches, shortness of breath, and fatigue and blood pressure issues, would those be things that could be caused by a brain injury?

A. Well, some of those. I mean, that's a very wide constellation of complaints. And some of those may be associated with the brain. When you start talking about kidney pain, problems with her lung, that would have nothing to do with a brain injury. No.

Q. What about reduced feeling or loss of feeling in her right arm and her left leg?

A. And that would be described as a peripheral neuropathy. And it's certainly not specific to heat stroke, as far as I can tell.

Q. Now, with respect to long-term effects, did you have an opportunity to review a report from a Dr. O'Connor regarding Ms. Spencer?

A. Yes.

Q. I believe that was in March of 2010. Do you remember the symptoms that she was complaining of at that time?

A. Not specifically. No.

Q. And if they were at that time blurred

214

vision, was that something that would concern you?

A. Once again, it wouldn't change my opinion. No.

Q. How about shortness of breath?

A. Wouldn't change my opinion either.

Q. Are those things that can be caused by a brain injury?

A. Not the shortness of breath most likely. No.

Q. How about the blurred vision?

A. Could be. Yes.

Q. And did Ms. Do provide you with a copy of a letter from Ms. Spencer to Ms. Polk that is dated December 6th of 2010?

A. I don't recall that letter. No.

Q. If in that letter she -- Ms. Do never gave you a copy or that?

MS. DO: Your Honor, I'm sorry. I object to the hearsay. Unless the witness has seen it and has relied on it and he's reading it into the record, it's just blatant hearsay.

THE COURT: Yes. Has this been part of the information provided?

MR. HUGHES: It's been disclosed, Your Honor.

MS. DO: It's been disclosed to the defense.

215

I don't know if it's been provided to the doctor. The doctor can confirm that.

THE COURT: Sustained as to the form of the question.

Q. BY MR. HUGHES: Doctor, if Ms. Spencer had said in December of 2010 that after six months --

MS. DO: Your Honor --

THE COURT: Sustained.

Q. BY MR. HUGHES: Doctor, you said you reviewed the O'Connor report regarding Ms. Spencer?

A. Yes.

Q. If the report indicated that three weeks after the incident Ms. Spencer was still complaining of blurry vision, fatigue, insomnia, disequilibrium, cough and heaviness in the lungs, headache, back and leg pain, increased nocturnal urination, left foot drop/weakness, decreased motivation, and generalized malaise, are those the sort of things you would expect to see, or some of them at least things you would expect to see from a brain injury?

A. It's really not specific. And as you're suggesting, certainly not all of them could be explained by a brain injury. The neurologic

216

symptoms certainly could be explained by a mild brain injury or from another exposure.

Q. And the neurological symptoms -- would that include the blurry vision?

A. Yes.

Q. Disequilibrium?

A. Yes.

Q. Can you tell us what disequilibrium is.

A. Feeling like -- feeling like you're off balance, unsteady.

Q. Left foot drop/weakness. What does that mean?

A. So a left foot drop would be more likely associated with a peripheral nerve process. And so it would be -- unlikely to be able to correlate that directly to heat stroke. And it's a pretty nonspecific complaint.

Q. Doctor, could you pull that microphone up in front of you a little closer. Maybe a little closer than that.

Yes. That would work?

A. Is that better?

Q. We weren't able to talk to Ms. Wong, so I don't -- I can't ask you about her. But let me ask you about Liz Neuman. I think you testified that

her clammy skin that was seen you believe was inconsistent with heat stroke?

A. That's correct. Yes.

Q. Can you explain that.

A. And one of the cardinal signs of heat stroke is anhidrosis, or the lack of sweating or losing the ability to sweat. And in the medical records she's described as having cool, clammy skin, which really means kind of wet, cool skin and -- suggesting that she's continuing to produce sweat from her sweat glands.

Q. Do you know whether anhidrosis is a requisite or a necessary finding for heat stroke?

A. It's part of the trilogy of diagnosis. Yes. The three are mental status changes, temperature of 105 degrees, and anhidrosis.

Q. Do you know whether the medical literature documents, including the medical literature that you provided to Ms. Do and then to Ms. -- and then me, that documents that patients can present without anhidrosis?

A. It can. And it's not a firm necessity. But it is part of the three signs and symptoms of heat stroke.

Q. Would you agree, then, that some patients

may retain the ability to sweat, removing anhidrosis as a criteria for the diagnosis of heat stroke?

A. And can you tell me the source?

Q. Yeah. Absolutely. Let me show it to you and make sure I read it correctly. Is this document -- I believe it's from eMedicine entitled "Heat stroke." Is that one of the documents that you provided? And I apologize. It was given to us in about four point font so it's kind of hard to read.

A. It's very hard to read. And can you point out where you were reading?

Q. Yes. Well, first let me ask you, is this one of the articles that you provided and that you relied upon?

A. Yes.

Q. Okay. And then over here under clinical history --

And, Ms. Do, it's Bates stamped as Defense 60.

MS. DO: Thank you.

Q. BY MR. HUGHES: That paragraph there and --

A. And the problem with this paragraph is

this --

Q. Hold on a second. I think you're turned off.

A. Can you hear me?

Q. Yes.

A. The problem is that this paragraph is not differentiating between exertional and nonexertional heat stroke for one. In exertional heat stroke the patient can maintain the ability to sweat. And the reason being is that oftentimes in exertional heat stroke they continue to hydrate.

The problem is that their ability to cool themselves off is inadequate in a superheated environment and that they can reach the 105-degree threshold for heat stroke. So certainly in exertional heat stroke you can maintain the ability to sweat. Yes.

Q. And you mentioned that paragraph doesn't differentiate. It just says some patients may not have anhidrosis --

A. That's correct.

Q. -- and, therefore, it's not always a diagnostic criteria.

Can you show us the article, then, that says that that would only apply to exertional heat

stroke.

A. I'm not saying that it would only apply to exertional heat stroke. It would be a much more common finding in exertional heat stroke. And this area is not differentiating between the two.

Q. Okay. Can you show us the article that says that it would be much more common in exertional heat stroke as opposed to nonexertional?

A. I'm not exactly sure what source -- or I couldn't identify that immediately what source I read that in.

Q. Did -- do you believe that's in one of the articles that you provided to Ms. Do when you were asked to provide the articles you had relied upon in making your report?

A. Yes.

Q. You believe it's in here?

A. Oh. I don't know if it's in there or not. I don't.

Q. Well, are there other articles, then, that you relied upon that you didn't provide to Ms. Do?

A. I've had training in heat-related injury. I'm an ER physician. It would be a very common subject for me to read either during my training or

after my training. And I can't tell you exactly where I read that source. It would be, basically, understood in the medical literature that there is a clear differentiation between exertional and nonexertional heat stroke. I think it's imperative that you make that difference because they can present in different ways. And they -- and they affect a completely different group of patients.

Q. Do you believe that's an important distinction?

A. Yes.

Q. Would it surprise you that not a single one of these articles on heat stroke that you provided make that distinction?

MS. DO: Objection. Assumes facts not in evidence.

THE COURT: Sustained.

Q. BY MR. HUGHES: Doctor, can you point out to me, then, a single article that you provided that makes that distinction.

A. I don't know if it's in there or not in those articles. I don't recall. No.

Q. Well, these are articles that you indicated you had reviewed to prepare your report?

A. Yes.

Q. And you don't know if it's in the articles or not?

A. I don't recall at this moment. No.

Q. Well, would you look through them, then, and tell me if you can find that distinction in any of those articles.

THE COURT: Mr. Hughes, once again, I had mentioned before we were going to take two recesses because I have to break at 90 minutes. So why don't we do that if we can.

MR. HUGHES: Thank you, Your Honor.

THE COURT: Ladies and gentlemen, again, remember the admonition for us. Please be reassembled at 4:00. Thank you.

(Recess.)

THE COURT: The record will show the presence of Mr. Ray, the attorneys, the jury.

And the witness, Dr. Paul, is on the stand.

MR. HUGHES: Thank you.

Q. BY MR. HUGHES: Doctor, have you had a chance to look through the reports that you provided?

A. The references. Yes.

Q. And, I'm sorry. The references. The

medical articles?

A. Yes.

Q. And were you able to locate wherein it indicated that the anhidrosis is seen in nonexertional heat stroke patients and not seen in -- or excuse me, anhidrosis is seen in nonexertional but you might expect to -- I think I may have it around the other way.

Tell us what you found before I try it a third time.

A. Well, the point I was -- the point I was trying to make is that in exertional heat stroke --

I can't get this thing close enough to work.

In exertional heat stroke some people maintain the ability to sweat and -- as compared to patients in nonexertional heat stroke.

In nonexertional heat stroke patients do not maintain the ability to sweat. And that is stated in this article that I provided. And I'll read the sentence.

Because their ability to sweat remains intact, patients with EHS, which stands for exertional heat stroke, are able to cool down after cessation of physical activity and may present for

medical attention with temperatures well below 41 degrees Celsius.

Q. Now, where in there does it say that patients with nonexertional heat stroke will always lose the ability to sweat?

A. So I'd have to go through this again, but the hallmark of nonexertional heat stroke is anhidrosis, mental status changes, and an elevated temperature.

Q. And do you believe you saw in there that it indicates that a patient with nonexertional heat stroke would always have lost the ability to sweat?

A. It's a hallmark in that process. But I did not read specifically that they always lose the ability to sweat. No.

Q. And did you look through the article?

A. Yes. And I don't see it.

Q. Okay. Now, I'm going to -- I'm going to ask you a question about something you weren't asked about. So I don't want to -- and then I'm going to move back. But I don't want to forget this topic.

Did you recall looking at medical records for Lou Caci?

A. Yes.

Q. And specifically -- let me see if I can find his records.

May I approach the witness regarding the microphone?

THE COURT: Yes, you may.

MR. HUGHES: The technical problems don't always go the way you see them on TV in trials.

THE WITNESS: No.

Q. BY MR. HUGHES: Now, do you recall seeing in Mr. Caci's records whether he presented -- or was diagnosed with something called "denuded skin"?

A. Yes.

Q. Can you tell us what denuded skin is.

A. And I'm going to find the specific reference in the medical record before I comment.

Q. Okay.

A. And it was described that he had blistering of the skin and that those changes were consistent with a thermal injury.

Q. And by "thermal injury," do you mean a burn?

A. Yes.

Q. And, Doctor, do you have Bates numbers in front of you?

A. Yes.

Q. It might speed you up if you go to Bates 164.

A. I have it.

Q. Okay. You indicated you wanted to look at the record before you told us what denuded skin is. Can you tell us what denuded skin means.

A. What this physician was referring to is a burn on the right arm or hand and that the skin is peeling, which is what "denuded" means. And on Bates 1685, there is a sentence that describes this injury.

Q. Can you tell us what that sentence says.

A. It says, he then fell onto some hot coals and sustained burns to his right upper extremity.

Q. And what degree of burn would you have when you have denuded skin?

A. If the patient still feels pain, it would be a second-degree burn because you have blistering.

Q. And is that what's indicated on page 1684? And, Doctor, is that your own copy that you're looking at?

A. Yes.

Q. Okay.

A. It vaguely states in his medical record

that he complained of pain. It doesn't say where he's complaining of pain, but I'm assuming it's on his right hand. And if that's the case, it would be defined as a second-degree burn where you have blistering of the skin but you still have sensation.

Q. And can you explain what the terminology means referring to that page? It says, he then has an, essentially, second-degree burn in a large area of -- and there is a blank -- blistering with denuded skin to the lateral palmar surface of his right upper extremity and then to his medial forearm. What would be denuded skin of the lateral palmar surface of your right upper extremity?

A. It's likely that he had a burn on that area and that the skin had peeled off.

Q. Okay.

A. I believe that's what he's referring to.

Q. Okay. And, Doctor, you were asked some questions, and I'm going to be asking you a number of questions about nicotinic and muscarinic receptors and organophosphates. And specifically if you have a compound that's an organophosphate, would you expect to see that it has an effect on nicotinic or muscarinic, or does it depend on the

compound?

A. And typically organophosphates will affect both. And that's what accounts for the common signs and symptoms of organophosphate toxicity. The symptoms, such as salivation, lacrimation, pulmonary edema, would all be associated with nicotinic receptor activations. And nicotinic receptor, that's responsible for those secretions.

The symptoms that affect the bowel and gastrointestinal tract -- nausea, vomiting, diarrhea, and also the bladder -- would be attributed to muscarinic. So typically organophosphates would affect both of those receptor types.

Q. Now, the nausea and vomiting that you spoke about -- are those symptoms that you could also expect to see with heat stroke?

A. Yes.

Q. And why is that?

A. And the assumption is that you're diverting blood away from the gastrointestinal tract in order to facilitate heating. So that would be one mechanism in heat stroke.

Q. Now, Ms. Do asked you some questions

about the seating chart that was prepared. And I think you indicated that you believed that a person who was seated, say, on their buttocks might be less likely to absorb an organophosphate than someone who had their face in the dirt, for want of a better word.

A. I didn't say less likely to absorb. I said likely to absorb the toxin at a different rate.

Q. Okay. And if people were seated but had their swimsuit on, for example -- you know -- covering their buttocks, would that affect the rate of absorption?

A. I assume that it would impede the rate of absorption. Yes. Because you have another layer that the toxin would have to penetrate.

Q. Do you have an idea of how much of an organophosphate someone would have to be sitting in to be able to absorb a lethal dose?

A. It really would depend on the compound itself.

Q. Have you done any research into common household pesticides, insecticides, that type of thing you would by at Walmart or Home Depot?

A. No.

Q. Were you asked to do any of that research?

A. No.

Q. Do you have any -- have you -- let me ask you this: Have you -- when you were a physician treating living patients, did you ever treat a patient who was poisoned by organophosphates?

A. No. Not that I recall.

Q. Have you done an autopsy on a patient who has died from organophosphates?

A. No.

Q. How about the meetings that you hold? I think you said once a week you get together with other doctors in your office. Are you aware of any of them doing autopsies on someone who has died from organophosphates?

A. No.

Q. As you sit here today, are you aware of any common household organophosphates that are so toxic that sitting on a spot that had been treated by that organophosphate could kill you?

A. That's outside my area of expertise.

Q. So are you aware of any?

A. No.

Q. Ms. Do asked some questions about

inhaling and what could be assumed if an organophosphate was airborne. And if we were to assume that people were in a relatively -- you know -- 23 foot, 24 foot sweat lodge space, if there is an airborne organophosphate in there, would you expect -- what would you expect to see happen to all of the participants or the majority of the participants?

A. I think they probably would have been equally affected in such a small, confined space.

Q. Do you have an opinion, then, whether, assuming this was organophosphates, it was an airborne organophosphate?

A. I don't believe it was. No.

Q. Now, if the jury has heard testimony that a number of participants have consumed the food and the water that was out for participants and did not become ill, would you have any opinion as to whether the food and the water could be the source of the organophosphate?

A. If the organophosphate was ingested, you would expect that person to become symptomatic. So if all the participants ate the exact same food, you would expect them to become symptomatic as well. I don't know what the participants ingested

during that retreat.

Q. And, Doctor, can you tell us, then, what the clinical diagnostic criteria are for diagnosing nonexertional heat stroke.

A. And as I've explained before, the common trilogy for -- or diagnostic trilogy for nonexertional heat stroke are mental status changes, elevated temperature -- really probably the most accepted number would be 105 degrees and above -- as well as losing the ability to sweat.

Q. Are those diagnostic criteria that you use in the cases that come to your office -- you've indicated -- how many autopsies have you performed on persons who have -- you've determined died of heat stroke?

A. Roughly 10 to 12.

Q. And did you use those -- were those nonexertional or exertional heat stroke cases?

A. They would have been exertional heat stroke cases.

Q. And you indicated that at least some of them were persons who were crossing the border into the country?

A. Most likely. Yes.

Q. Okay. On those particular persons, did

you have intact remains or skeletonized remains?
A. Some were intact, and some were skeletonized. So it was mixed.
Q. Would you agree with a doctor who said that, essentially, an autopsy for heat stroke is a negative finding autopsy? You look to the circumstances surrounding where the body is found?
A. No. I wouldn't agree with that necessarily. And I think that's well demonstrated in the two examples that I provided in my report. And in nonexertional heat stroke dehydration is a prominent component and can easily be visualized at the time of autopsy by testing the vitreous fluid. So it's not necessarily a negative autopsy. No.
Q. When you've had skeletonized remains, were you able to test the vitreous fluid?
A. No.
Q. How about putrefied remains?
A. No.
Q. How many of the 12 autopsies that you've performed that you were able to test vitreous fluid on?
A. Of those 10 to 12, none.
Q. Of the 10 to 12 that you've performed, how many were you able to get a rectal temperature

at the time of exposure to heat?
A. None.
Q. What criteria, then, did you use for determining whether the person had died from exertional heat stroke?
A. So for the mildly decomposed individuals that I've autopsied who have died of heat-related illness, the autopsy was very helpful in looking for any evidence of natural disease or traumatic injuries that might explain death. And so that's the reason why an autopsy is performed.
In skeletonized remains it's really almost impossible to make the diagnosis of heat stroke or heat-related illness. Not enough of the body remains to rule out natural disease, and not enough of the body remains to rule out all traumatic injuries.
So mildly decomposed individuals would be signed out as heat-related illness because we're able to rule out natural disease or significant traumatic injuries. Skeletonized remains, although we suspect they're heat related, are typically signed out as undetermined.
Q. So of the 10 to 12 that you're telling us about, do you have an idea of how many were ruled

as undetermined?
A. Probably nine -- eight or nine.
Q. With respect to the diagnostic criteria for medical examiners, did you provide to Ms. Do and then to me a -- and she to me -- an article that pertains to diagnostic criteria for determining cause of death for medical examiners?
A. Yes.
Q. And do you have a copy of that in front of you?
A. Yes.
Q. Let me see if I can find it. And, Doctor, let me turn your attention to --
Ms. Do, it's Bates Defense 38.
-- the article titled "Criteria for the Diagnosis of Heat-Related Deaths: National Association of Medical Examiners: Position Paper."
First of all, let me ask. What's the National Association of Medical Examiners?
A. It's our national association for all medical examiners in the country.
Q. And was this an article you relied upon in preparing your report?
A. Yes.
Q. And what's a position paper?

A. So it's a general consensus of that national group.
Q. And, Doctor, is it your opinion, then, that the consensus of the national group is that a finding of dehydration is necessary for determining whether a patient has died from heat stroke?
A. Not according to the position paper. No. That's correct.
Q. Is it your opinion, though, that in your cases you expect to find a finding of dehydration?
A. Yes.
Q. And why is there a difference between your opinion and the position paper of the National Association of Medical Examiners?
A. Because oftentimes, as I've intimated before, we're not able to test for vitreous fluid. So decedents that have been dead for typically more than 24 hours, we can't get vitreous fluid from the eye at that time. And so -- you know -- many times we can test for vitreous fluid, but oftentimes we can't obtain vitreous fluid because of decompositional changes.
Q. And would that be a similar reason why in some cases you don't have a rectal temperature, for example?

A. Yes.
Q. Now, this national association does stick to a rectal temperature when they say it can be determined?
A. Yes.
Q. But they don't mention that when it could be determined dehydration should be a factor?
A. They don't mention that. No. That's correct.
Q. Do you know, then, why it's your opinion that there is this conflict between the national association and what you used to determine for cause of death?
A. I'm not sure if there is a conflict. They're just not mentioning anything in this paper. And so I'm not really sure why they're not using those diagnostic criteria. No.
Q. In fact, the paper talks about -- has a number of case studies in it; correct?
A. Yes.
Q. Would you agree with me a number of the case studies included people who had been deceased long enough that they were, basically, putrefied?
A. That's correct. Yes.
Q. And some of these people were seen

relatively quickly after they died?
A. That's correct. And the other -- well, the other reason they're not included in this article and -- is because the nature of nonexertional heat stroke is that it affects the very old and very young typically. And this position paper was written in order to direct medical examiners on how -- or what they should rely on in cases of heat related mass disasters to make a diagnosis of heat-related illness.
Since nonexertional heat stroke oftentimes effects preferentially the very old and the very young, their deaths can be accelerated because they have other medical conditions. It's not unusual for an older person or an older person with heart disease or other medical conditions to die early on when exposed to extreme heats -- or extreme heat. And they die before they develop significant dehydration because of their other medical problems.
It's the same thing for young children. They can die very rapidly without becoming dehydrated as well. So that's another reason why they did not include dehydration in the diagnostic criteria.

Q. And did they discuss that reason in the article?
A. No. But it's well-known and certainly in other articles that nonexertional heat stroke is typically a disease of the older, younger, and those with underlying medical conditions.
Q. So is your testimony now that for nonexertional heat stroke, you might not -- you might not see dehydration in the very young or the very old?
A. That's correct. Yes.
Q. Now, the -- this paper by the national association does have a case study about a 37-year-old man, and I'm referring to case No. 5, which is on page 5 of the paper. And that was a man who was last seen alive at 11:30 and then was found in a closed automobile at 1:45 and on an August day.
Would you expect a 37-year-old man to display these problems that the elderly or the very young might have regarding dehydration?
A. If you read the entire case study, he has what's described as moderate coronary disease, which is a significant medical risk factor. He's also a chronic alcoholic and is intoxicated with

alcohol at the time of his presentation. So those are all confounding factors in this heat stroke case.
Q. How would the intoxication with alcohol factor in?
A. And the alcohol itself is a peripheral vasodilator. And with acute intoxication, it's much more difficult to regulate body temperature in general. And the coronary artery disease would put him at higher risk for experiencing sudden death or dying earlier in the course of the heat exposure. So it --
MS. DO: Your Honor -- I'm sorry to interrupt Mr. Hughes. For completion under Rule 106, I ask that the body temperature be --
Q. BY MR. HUGHES: Doctor, what was the -- for that case study what was the body temperature of the man found in the car?
A. 107.4 degrees Fahrenheit.
Q. And my question, though, is if dehydration is something that you would expect to see in a 30-some-year-old person -- we have a case study of a 37-year-old person, but there is no mention even in that case study of whether he's dehydrated or not.

A. Well, I said it affects the very young, the very old, and those with other significant medical conditions. Having a moderate coronary artery disease is a significant medical condition. So is being a chronic alcoholic who is acutely intoxicated.

Q. Do you --

A. I think those are confounding factors in this case.

Q. Do you recall whether in the autopsy reports any of the decedents had any problems with their heart?

A. Yes.

Q. Which decedents?

A. And the two decedents who did were James Shore and Liz Neuman.

Q. And what was noted for Mr. Shore?

A. He had an enlarged heart. It was 490 grams. And also mild to moderate coronary artery disease.

Q. And what was seen for Ms. Neuman?

A. She had a mildly enlarged heart. It was 425 grams. And she also had mild to moderate peripheral coronary artery disease.

Q. Now, would you -- this fellow here in the

case No. 5, it says the heart showed moderate coronary atherosclerosis with 50 percent occlusion of the left anterior descending coronary artery.

Do you know the percent occlusion for Mr. Shore or Ms. Neuman?

A. I just remember that it was described as mild to moderate. I'd have to go back to the autopsy report to glean that information.

Q. Would you agree or disagree that the gentleman in case No. 5 showed moderate coronary atherosclerosis?

A. No. That's how it's described in case No. 5. Yes.

Q. So my question -- and that may have been a bad question on my point -- on my part. Would you agree or disagree with that conclusion that it was moderate?

A. Yes.

Q. Do you --

A. Yes. I agree.

Q. Okay.

A. It was moderate in both cases.

Q. Thank you.

Do you agree with the findings, though, of your national association in the position paper

for the diagnostic criteria for heat stroke?

A. Can you be specific where you're referring to.

Q. On page 7 in the conclusion.

A. Yes.

Q. Specifically the committee recommendation that the diagnosis of heat-related death be based on a history of exposure to high ambient temperature and the reasonable exclusion of other causes of hyperthermia?

A. That's part of it. Yes.

Q. Now, I'll go through it bit by bit. It says the diagnosis -- would you agree that the diagnosis may be established from the circumstances surrounding the death, investigative reports concerning environmental temperature, and/or measured antemortem body temperature at the time of collapse?

A. And you'd have to add the caveat exclusion of other causes of death. Yes.

Q. And at least for this position paper, they don't -- they do not include dehydration as a component?

A. That's correct. Yes.

Q. Do you agree with the statement that in

cases where the measured antemortem body temperature at the time of collapse was greater than or equal to 105 degrees Fahrenheit, the cause of death should be certified as heat stroke or hyperthermia?

A. With the exclusion of other causes of high temperature, yes.

Q. And would you agree with the statement: Deaths may also be certified as heat stroke or hyperthermia with lower body temperatures when cooling has been attempted prior to arrival at the hospital and/or when there is a clinical history of mental status changes and elevated liver and muscle enzymes?

A. Yes. And that statement is being made with the caveat that other causes of death have been excluded, and that's why an autopsy was performed.

Q. And then they indicate in the next paragraph at the beginning, in cases where the antemortem body temperature cannot be established but the environmental temperature at the time of collapse was high, an appropriate heat-related diagnosis should be listed as the cause of death or as a significant contributing condition?

A. And, once again, that's with the caveat that other causes of death have been excluded. Yes. And I think -- I think -- if I can continue, I think the sentence that needs to be read is --

Q. Okay.

A. -- in this third paragraph of page 8 of that article. It states in the middle of that paragraph, it is appropriate -- it's actually the second paragraph. There is a sentence above the first. It is appropriate to certify a death as heat related if investigation provides compelling evidence of continuous exposure to a hot environment and fails to identify an independent cause of death.

Q. And in this case it's your opinion that there may be an independent cause of death apart from or to the exclusion of heat stroke?

A. I think there are other possibilities. Yes.

Q. And that decision is based on -- in part at least on these factors that Ms. Do has written down on the chart; is that correct?

A. That's correct. Yes.

Q. The no evidence of 105 degrees Fahrenheit?

A. Yes.

Q. No evidence of severe dehydration?

A. Yes.

Q. Anhidrosis?

A. Yes.

Q. And are those the only factors, then?

A. There was no evidence of anhidrosis.

Q. Okay. No evidence of anhidrosis.

Now, would you agree with me that at the time all of these patients left the sweat lodge, there was no rectal temperature available?

A. Yes.

Q. And would you agree with me that the rectal temperatures that were taken from the persons for whom we have the rectal temperatures occurred at the very earliest about an hour after the sweat lodge ceremony ended?

A. Yes. That's approximately correct.

Q. And would you agree that with an hour's passage of time, the temperature that you might get is not as significant in determining whether a person is suffering from heat stroke?

A. The temperature would be lower at the time the temperature was taken if there was a delay of an hour and the patient was removed from that heated environment. Yes.

Q. Do you know what the temperature was in that area on that evening that the patients were removed from the sweat lodge?

A. In Sedona that day, the high temperature was 70 degrees Fahrenheit.

Q. And, Doctor, have you -- were you provided a copy of the official temperatures from the Yavapai County Flood Control District Alert System?

A. No.

Q. Do you know what the temperature was that evening on October 8th approximately around 5:00 o'clock?

A. No.

Q. I'm going to show you this. Here you can see there is a column for time.

MS. DO: Your Honor, what exhibit number is this?

MR. HUGHES: I'm sorry. It's Exhibit 148, which is admitted in evidence.

MS. DO: Okay.

Q. BY MR. HUGHES: There is a column for time. And this is at the Sedona airport. And you're from New Mexico. But if I were to represent

that it was about five and a half miles from Angel Valley -- we'll go with that representation.

So here's a column for time, humidity, and temperature and then wind gust. Do you see that?

A. Yes.

Q. And then over here there is another column for -- these are wind gusts. The peak wind gust, and that's just wind speed. Do you see that?

A. Yes.

Q. So if we wanted to determine the temperature approximately when the sweat lodge ended, if it ended at 15 -- or 1703, you would agree that would be 5:03 p.m.?

A. Yes.

Q. And if there is some -- unknown to the exact time it ended, but if it ended at around that time, you would agree the temperature was about 66 or 67?

A. Yes.

Q. And would you agree that the wind was also gusting around that time from anywhere between 26 miles an hour and 13 miles an hour?

A. Yes.

Q. Now, for that hour's time, then, that

249

Ms. Neuman was outside the sweat lodge and before the -- before the temperature was taken at 6:25, do you know what efforts were made to cool her down?

A. I'd have to review the records. No.

Q. Do you recall what was done to cool her down?

A. Well, my recollection for all those patients is that some -- or the critically ill patients and those that died, that some were not actively cooled and some had some water placed on them. I don't know the quantities. And I can't recall at this moment which patients did get water placed on top of them.

Q. Assuming hypothetically Ms. Neuman when she was taken out was wetted down and then had clothing removed, do you have an idea how she could cool from the time of, say, 5:03 to the time that the EMS arrived later that evening?

A. The only objective information I can give you is that the -- once again, the maximum cooling rate with aggressive cooling measures is approximately .1 degree Celsius per minute. So with aggressive cooling, yes, the temperature could have been significantly reduced over that 60-minute period.

250

Q. What about wet skin and wind that's gusting from somewhere between 26 miles an hour and, say, 8 miles an hour?

A. So if water was continuously placed on her so she was continuously wet --

Q. And I'm not asking you to assume that because that's -- I don't think there is any evidence it was continually placed. But if she was wetted down and then placed in that environment, what would be your expectation for her heat loss?

A. Well, that's an important distinction. Because in a low humid environment with wind, that water will rapidly evaporate. So it makes a huge difference whether water was placed on her once or water was continuously placed on her over that one-hour period. And so I think that's a very important distinction.

If, like, just a couple of cups of water were placed on the body, that water would evaporate within minutes. We know that just from living in the desert. And the evaporative effect on the body temperature would actually probably be very small just from the water itself.

Q. What would you expect, then, over the course of the hour, assuming that was the case,

251

that she was wetted down originally and the wind gusting, the humidity -- we can see the humidity is pretty low. What would you expect to see as far as temperature loss over that hour's time?

MS. DO: And, Your Honor, I'm sorry. To understand this hypothetical, could counsel point to what time we're looking at on this exhibit.

Q. BY MR. HUGHES: Well, let me ask you this: Assuming hypothetically that the sweat lodge ceremony ended around 5:00 o'clock, do you see where that would be located on this chart?

A. Yes.

Q. And then assuming hypothetically that the EMS folks got to Ms. Neuman and conducted their exam around the time indicated on your chart, 6:17 p.m., we're talking about an hour. Would you agree with that?

A. Yes.

Q. And the sweat lodge ceremony may have ended at 5:20 instead of 5:00 o'clock. Do you realize that?

A. I don't recall that.

Q. Assuming we're talking about an hour's period of time and the -- Ms. Neuman was wetted down originally, had her clothing removed, what

252

would you expect to see with those -- that humidity and that wind gust? What would you expect to see her temperature an hour later?

MS. DO: Your Honor, again, objection. Vague. What is the wind gusts we're assuming?

Q. BY MR. HUGHES: And, Doctor, I'm referring to the exhibit in evidence on the chart, which indicates the wind gusts that were seen that night. Starting at 1703 are wind gusts of 26 miles per hour and going up to about 6:18 a wind gust of about 9 miles per hour.

A. And I can't give you an answer with confidence.

MS. DO: Your Honor -- sorry to interrupt -- pursuant to Rule 106, I'd ask counsel to show the time that is at the top on the right-hand column that has a wind speed at 5:00 o'clock.

THE COURT: If you slide the chart down a bit.

Q. BY MR. HUGHES: And, Doctor, let's assume there is a sustained wind speed of 7 miles an hour at 5:00 o'clock but it's gusting to 26 down to about 9 miles per hour. And then during that time period, the sustained wind goes from about 7 miles an hour down to about 2 miles per hour.

Do you have an idea of how much

253

temperaturewise Ms. Neuman could have dropped in that hour?

A. It would be pure speculation. The only objective experimental data I have is that of aggressively active cooling. So you could consider that in the answer, which is about .1 degree Celsius per minute. Anything beyond that would be purely a guess on my part. I don't have objective experimental data to back up that answer.

Q. Have there been any studies -- you indicated some studies of cooling in, for example, an ice bath. Have there been studies of what people cool at in temperatures -- you know -- 70-degree temperatures?

A. Not that I've seen. But the other confounding factor is here you have a small portion that's active cooling by placing water on the body, and then you also have passive cooling for much of the time as well. So it's really a difficult number to give you. I'm not trying to be obstinate. I really don't have an answer to that question.

Q. Well, you indicated on your chart that there is a temperature of 97 degrees, which is an axillary temperature at 6:25?

254

A. Yes.

Q. And then at the hospital there is a rectal temperature 20 minutes later of 101.6.

A. Yes.

Q. Now, what is an axial temperature?

A. Axillary temperature is using the armpit to take their temperature.

Q. And I believe you told Ms. Do that it was your opinion that there was some sort of a medical issue that caused Ms. Neuman to increase in temperature from the time of 6:25 to the time of 6:46?

A. Yes.

Q. Would that opinion assume that the axillary temperature is accurate?

A. No. And as I stated earlier, I think the axillary temperature most likely under-represents the true temperature. And just by personal experience, typically under-representation is within one or two degrees. So as I stated earlier, I believe that probably the maximum temperature at 6:25 with Ms. Neuman was upwards of 99.5 degrees Fahrenheit.

Q. Do you have any way of knowing what the rectal temperature would have been at 6:25?

255

A. No.

Q. Doctor, referring to this heat stroke article that I had mentioned previously, which is Defense Bates stamp No. 58 where it starts, do you recall the article by Robert S. Helman M.D., the one from eMedicine?

A. Yes.

Q. Do you agree -- have you read the paragraph on page 3 under clinical history that starts with, heat stroke is defined typically as hyperthermia exceeding 41 degrees Celsius?

A. Yes.

Q. And it says, anhidrosis associated with an altered sensorium?

A. Yes.

Q. What's an altered sensorium?

A. Change in mental status.

Q. Then it states, however, when a patient is allowed to cool down prior to measurement of the temperature, then it says, as may occur during transportation in a cool ambulance or evaluation in an emergency department, the measured temperature may be much lower than 41 degrees, making the temperature criterion relative?

A. Yeah. And really the implication of that

256

statement is that with patients who are in a heated environment and that are brought into the emergency department is not to disregard elevated temperatures but temperatures that are below the threshold. So 102, 102.5. So that's really the implication, although they don't explicitly say that. That's my interpretation.

Q. In fact, they indicate that a ride in a cool ambulance could cause a person's temperature to become not relevant for purpose of diagnosis?

A. Well, they intimate that it would lower during transport. And that's correct.

Q. And have you in your experience seen ice baths in ambulances?

A. No.

Q. Is it your opinion, then, that the authors of this article are talking about just the regular loss of heat from the body as it's sitting there laying in the ambulance?

A. In a cool environment. Yes.

Q. Would you characterize the temperatures that are indicated on this exhibit to be a cool environment?

A. Yes.

Q. So there is the no evidence of

105 degrees Fahrenheit on your clinical, no clinical evidence of heat stroke. And then there is no evidence of severe dehydration. And we've talked about the dehydration. And then it says, anhidrosis. And you indicated it should say, no anhidrosis.

A. That's correct. Well, it depends on how you look at it. To make the diagnosis of heat stroke, they should have anhidrosis.

Q. And in this case your opinion is is that there was no clinical evidence of heat stroke because there was evidence of anhidrosis?

A. There was no evidence consistently in the medical records that anhidrosis was present. That's correct.

Q. Now, what would you expect to see in the medical record for anhidrosis, which is the lack of the ability to sweat? What would you expect to see in the medical record for Ms. Brown?

A. So for the deceased patients?

Q. Yes.

A. And that means you stop sweating once you expire. So I wouldn't expect for the -- for -- I wouldn't expect her to have wet skin now.

Q. So would the medical records, then, not

tell us one way or the other whether Ms. Brown was suffering from anhidrosis?

A. That's correct. Yes.

Q. Okay. How about for Mr. Shore?

A. Same answer.

Q. The medical records won't tell us one way or the other?

A. That's correct. Yes.

Q. Unless the EMTs at the scene had seen sweat on the body, for example?

A. Yes.

Q. In this case, though, they didn't note that they had seen sweat on the body; is that correct?

A. Not that I recall. No.

Q. Would you like to look at the record?

A. That would have been a fact that I would remember. And I don't think any sweat was described on those bodies. No.

Q. Now, for Mr. Ray, did the medical records indicate anhidrosis?

A. No, they did not. In fact, their description was moist skin, pinpoint pupils.

Q. And what time was that diagnosis made for Mr. Ray?

A. That was in the emergency room.

Q. Do you recall the time?

A. I'm not sure if there was a time documented, but it was described in the ER note.

Q. Do you have Bates number 7093 handy?

A. Whose medical record are we looking at?

Q. Mr. Ray.

A. Yes.

Q. And looking at that medical record, do you know when he was first seen in the emergency department? And you may actually have to turn to page 7091, which is, I think, the start of the record.

A. It states at the top -- I assume that's the encounter time -- 1830 on 10/8/2009.

Q. And is there a -- going down the page, is there a physician exam time?

A. 1830.

Q. Assuming, then, that the moist skin was observed around 1630, is that something, then, that you would believe could rule out the fact that Mr. Ray was suffering from heat stroke?

A. No. I think "rule out" is not the appropriate term. I think that it's important information when you're comparing two different

diagnoses. Yes.

Q. And is that because there can be nonexertional heat stroke patients who continue to have the ability to have moist skin?

A. And we talked about that before. But that's much more common in exertional heat stroke patients, that they can maintain the ability to sweat. And I read that statement from eMedicine about 30 minutes ago. It's more -- it's unusual for nonexertional heat stroke patients to maintain the ability to sweat because dehydration is such a prominent component in that pathophysiology.

Q. Turning to -- keep turning back, if you would, to Bates 7091.

A. The same page.

Q. Would you tell us the -- under constitutional, which is under physical examination, it says, the patient appears to be having full tonic-clonic seizure activity. What does that mean?

A. He's seizing.

Q. And what does "tonic-clonic" mean?

A. So he's shaking when he's seizing.

Q. Is a seizure like that something that you would expect to see in a person suffering from heat

stroke?

A. You can.

Q. Is it also something that you could expect to see for organophosphates?

A. You can as well. Yes.

Q. And then it says, no diaphoresis.

A. So no sweating.

Q. And that is from the physician exam time of 6:30?

A. That's correct. Yes.

Q. Can you -- or is there a distinction between the statement that -- no diaphoresis and the later statement that indicates the patient had moist skin?

A. So as an ER doc, one would look for active diaphoresis in a patient, so beads of sweat forming on the forehead or beads of sweat in other areas of the body. So I think that most likely the ER physician looked for that and didn't note active diaphoresis. But when he touched the patient, he did feel moist skin, which is not consistent with anhidrosis. And that moist skin is also mentioned in the document that was dictated -- or concerned with the 1830 event in the ED.

Q. And that's part of the same record; is

that correct?

A. Yes.

Q. Okay. And I put it up, and I'm not sure where it is.

A. It's Bates 7093.

Q. Well, do you have the exhibit, or is that your personal copy?

A. It's my personal copy.

MR. HUGHES: Your Honor, I think it's about a minute to 5:00. Would this be a good time to stop?

THE COURT: We can do that.

We will take the evening recess, ladies and gentlemen. Again, please remember, follow the admonition. We'll start at the usual time. Be assembled at 9:15.

And, Dr. Paul, I want to remind you the rule of exclusion is invoked, meaning you can't discuss the case or your testimony with any other witness until the trial is over. But you can talk to the lawyers as long as other witnesses are not present.

THE WITNESS: Thank you.

THE COURT: Thank you. We are in recess.

(The proceedings concluded.)

STATE OF ARIZONA)
) ss: REPORTER'S CERTIFICATE
COUNTY OF YAVAPAI)

I, Mina G Hunt, do hereby certify that I am a Certified Reporter within the State of Arizona and Certified Shorthand Reporter in California.

I further certify that these proceedings were taken in shorthand by me at the time and place herein set forth, and were thereafter reduced to typewritten form, and that the foregoing constitutes a true and correct transcript.

I further certify that I am not related to, employed by, nor of counsel for any of the parties or attorneys herein, nor otherwise interested in the result of the within action.

In witness whereof, I have affixed my signature this 21st day of July, 2011.

MINA G HUNT, AZ CR No. 50619
CA CSR No. 8335

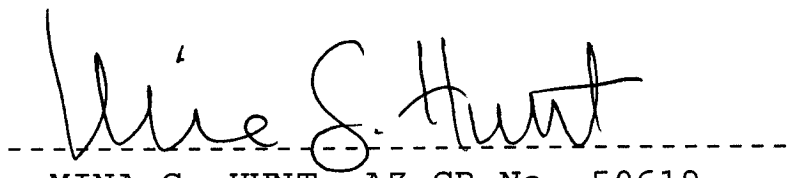
STATE OF ARIZONA)
) ss: REPORTER'S CERTIFICATE
COUNTY OF YAVAPAI)

I, Mina G. Hunt, do hereby certify that I am a Certified Reporter within the State of Arizona and Certified Shorthand Reporter in California.

I further certify that these proceedings were taken in shorthand by me at the time and place herein set forth, and were thereafter reduced to typewritten form, and that the foregoing constitutes a true and correct transcript.

I further certify that I am not related to, employed by, nor of counsel for any of the parties or attorneys herein, nor otherwise interested in the result of the within action.

In witness whereof, I have affixed my signature this 21st day of July, 2011.



MINA G. HUNT, AZ CR No. 50619
CA CSR No. 8335